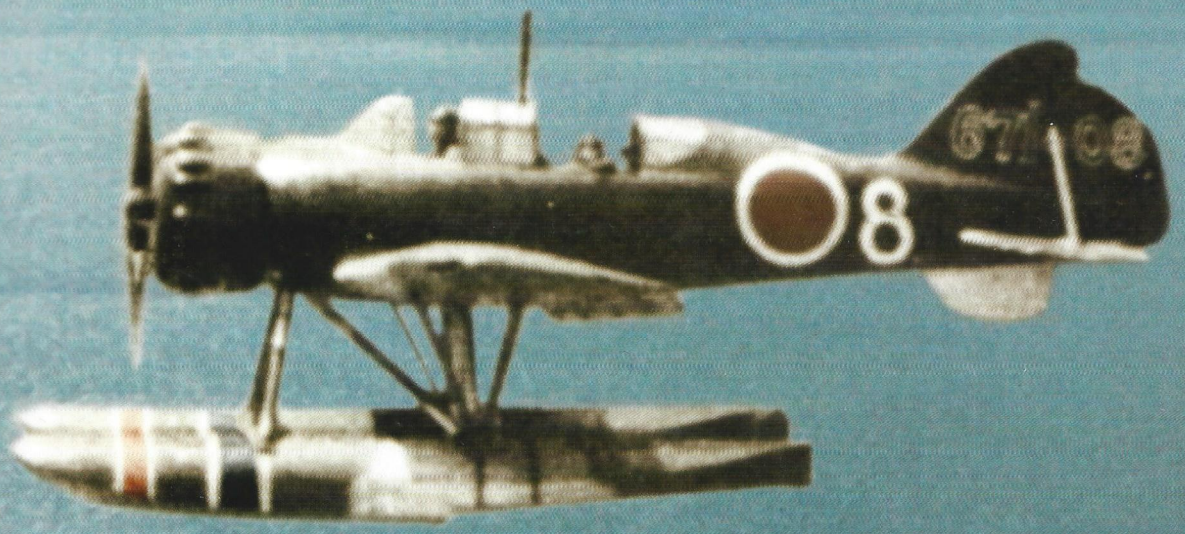
Ryusuke Ishiguro
Tadeusz Januszewski

Kugisho E14Y GLEN

The aircraft that bombed America



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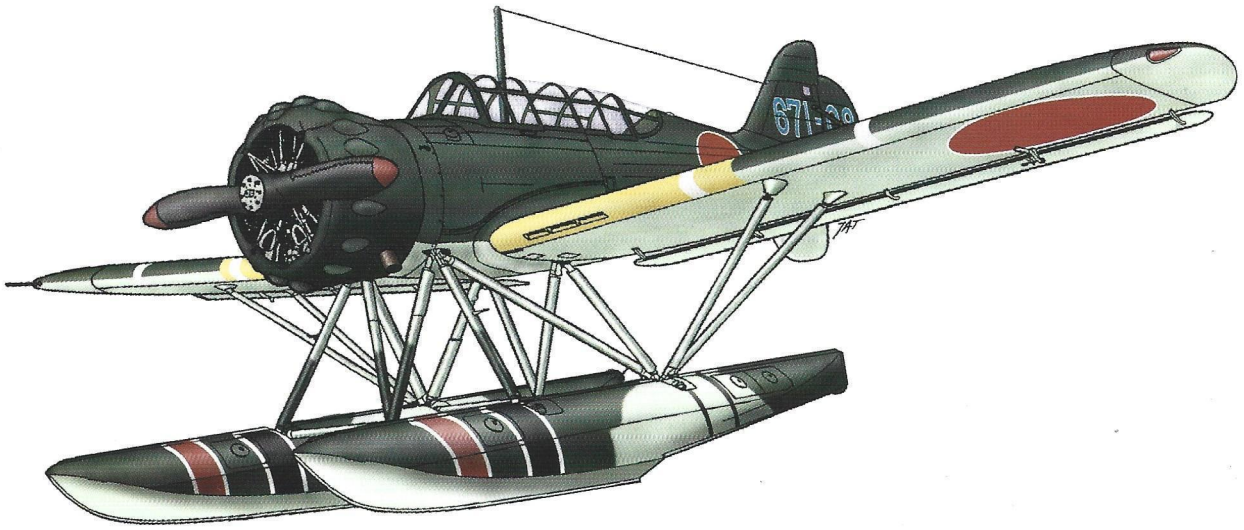
Kugisho E14Y1 GLEN

E14Y1 "Rei-shiki Kogata Suitei"

The aircraft that bombed America



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And personally to my Dad and Mom

Ryusuke

父陽一と母梅へ

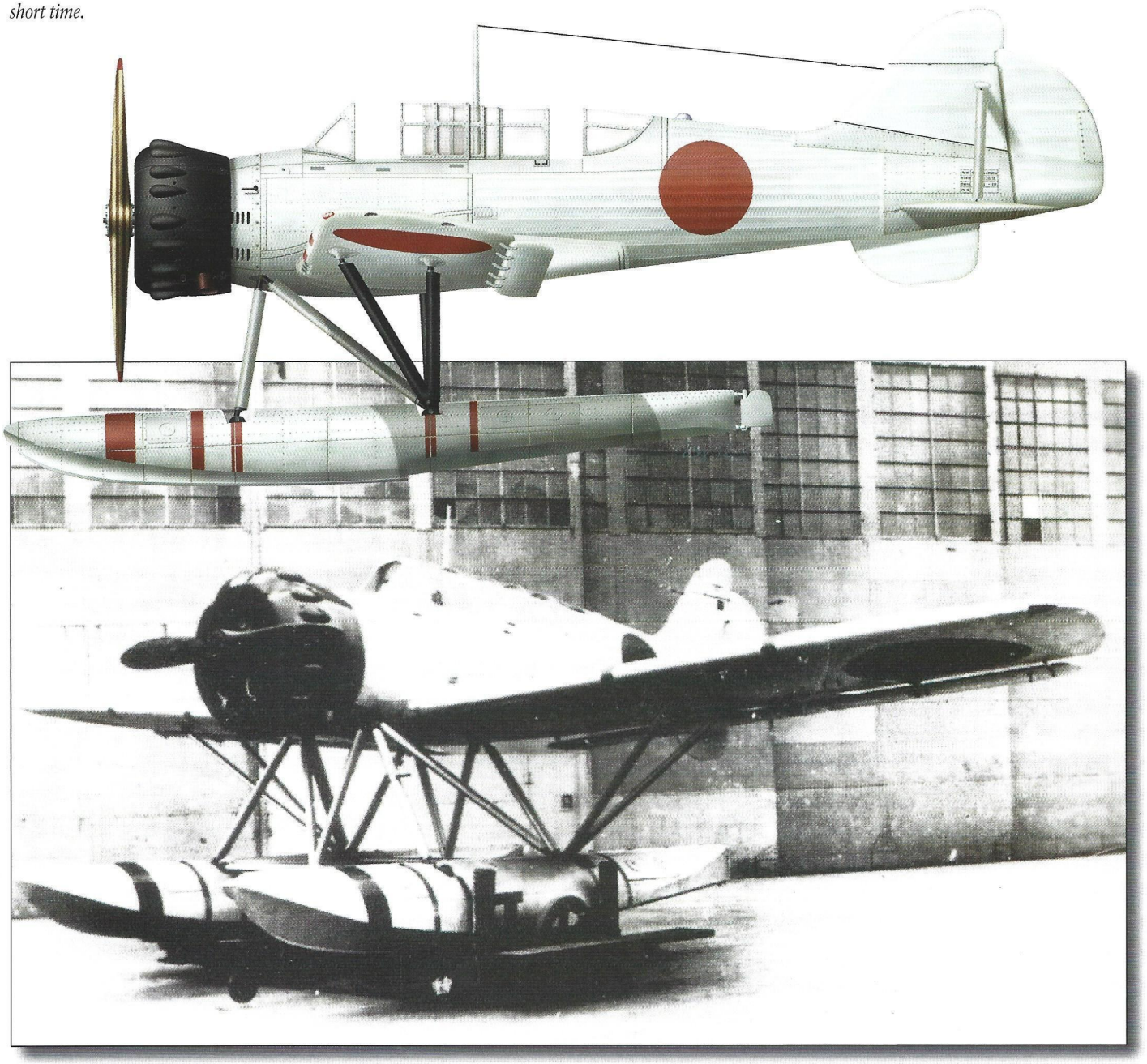
竜介

Title Page: Kugisho E14Y1 (Glen). Drawing by Z. Szeremeta

Introduction

The Kugisho E14Y1 reconnaissance seaplane, nicknamed '*Kingyo*' (goldfish) by Japanese pilots and known under the Allied codename "Glen", entered the annals of aviation history because during WW2 it was the only aircraft type to drop bombs in anger on mainland USA. E14Y1 seaplanes carried out two bombing raids on the Oregon coast near Brookings, on 9th and 29th September 1942. These attacks were retaliation for the famous "Doolittle" raid against Tokyo and other Japanese cities, carried out by B-25 Mitchell bombers from the aircraft carrier USS *Hornet*, led by Lt Col. Jimmy Doolittle.

'Type 0 Small naval seaplane Model 11' (E14Y1 Model 11). This is probably the 34th production seaplane, the assembly of which was completed on 28th October 1941. It did not have the standard dark green camouflage, but was painted silver overall with Hinomarus *without white outline. All stripes painted on the floats were red. Although the float strut system seemed very complex, in truth it only consisted of six subassemblies that could be assembled and disassembled in very short time.*

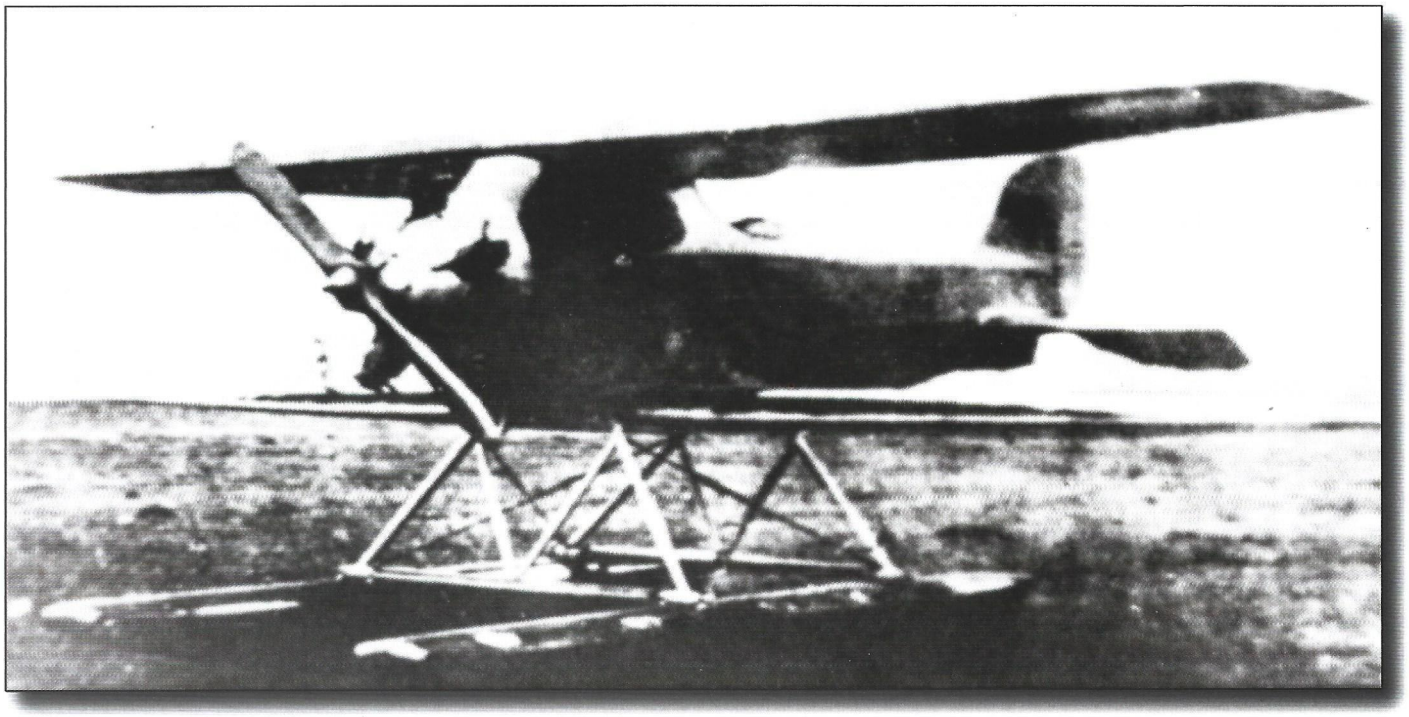


First experiments with submarine-borne seaplanes

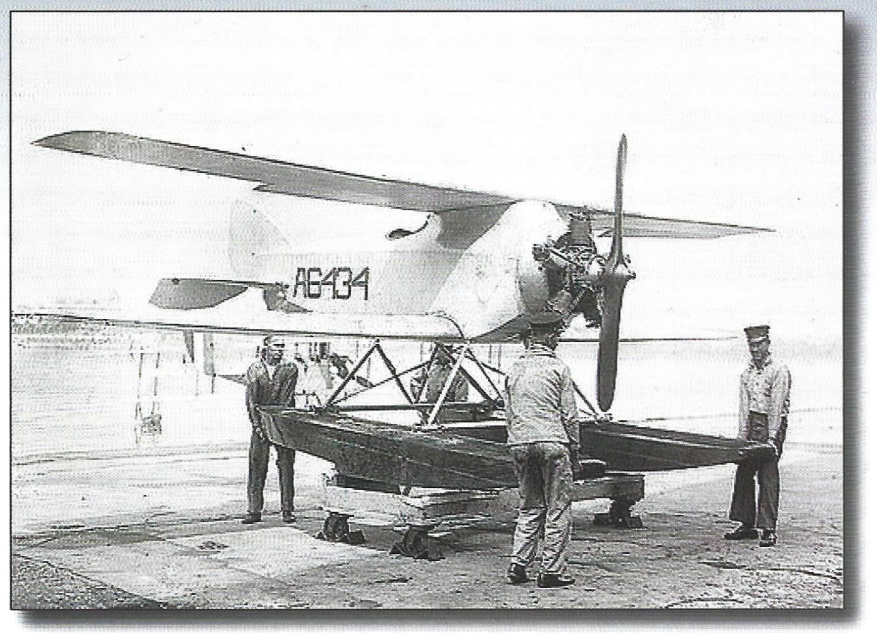
In November 1914 the Germans established a U-boat base at the Belgian port of Zeebrugge, and a month later, on 6th December, a naval air base was also set up there, with Friedrichshafen FF29a two-seater seaplanes. One of the pilots, Lieutenant Friedrich von Arnauld de la Periere, flew several sorties from there, trying in vain to achieve hits on British ships with 12 kg bombs. One of the reasons behind his failure was the limited range of the seaplanes of that time. For that reason, Lieutenants Friedrich von Arnauld de la Periere and Walter Forstmann, captain of the *U-12* submarine, during a social meeting came to the simple idea of carrying a seaplane on a U-boat closer to the site of the planned attack. This idea was tried on the morning of 6th January 1915. Lieutenant von Arnauld loaded his seaplane on a U-boat and sailed with her. Surprising the coastal defences in Kent, the German seaplane overflew the port. It was launched a mere 15 miles off the British coast, and took off under its own power. Upon return to base both officers were satisfied with the latest exploit, perceiving it as an example of new combat tactics. It turned the U-boat into a seaplane carrier, the aircraft being used for special tasks, mainly reconnaissance. The idea was sent to the High Command, but failed to achieve acceptance there. At the same time the British intensified their patrols in the English Channel and the North Sea, which forced the Germans to stop experimenting with U-boat seaplane transport, as the game was becoming too dangerous.

In 1917 the idea to transport seaplanes by submarines was resumed in Germany. Two large submarines, *U-139* and *U-155*, were converted, having enough room for Hansa-Brandenburg W20 small reconnaissance seaplanes. These were designed by Ernst Heinkel, and manufactured by the Hansa-Brandenburg company. In 1917 three such seaplanes were built, powered by 80 hp engines. A Brandenburg W20 seaplane was disassembled on the deck and stored in a special watertight hangar 6 m long and 1.8 m wide. During late October and early November 1918 Luft Fahrzeug Gesellschaft built the prototype of a new seaplane, the L.F.G. Putbus V-19. Even though it was

Caspar-Heinkel U-1 seaplane.



developed for land-based units, five production aircraft were modified for U-boat transport. Although its all-metal monococque structure was very good, the High Command did not give permission for its combat use, mainly because of the high risk of losing a submarine while coming to the surface to launch the seaplane. The end of the war meant the end of the argument.



Heinkel-Caspar U-1 during trials in USA.

News of the German experiments soon reached the USA and Japan. Germany, on the other hand, started construction of its principal aeroplane in utmost secrecy. It was designed by Heinkel, by then a well-known designer. The new aeroplane was designated Caspar-Heinkel U-1. It was a twin-float cantilever biplane of all-wooden construction. It could be disassembled and stored in a cylinder 7 m long and 1.8 m in diameter. Construction of the prototype was entrusted to the Hanseatischen Flugzeugwerke Karl Caspar AG Company at Travemünde. After it was first flown in 1921 and its advantages came to light, the Caspar-Heinkel U-1 seaplane immediately found buyers in the Japanese and US Navies, each placing a contract. U-1 seaplanes were delivered to the contractors in 1923, essentially as pattern models for indigenous designs.

The end of WW1 did not reduce the interest in the new weapon and all significant navies conducted work on submarine-based aircraft operations. Britain, France, USA, Italy, the Soviet Union and Germany (after the Nazis came to power) researched, with varying success, special aircraft and converted standard submarines for experiments, including the submarine transport question. But none of these countries built any 'submarine aircraft carriers' or manufactured such aircraft in series, and no such system was adopted as standard equipment by these fleets.

Japanese submarine aircraft carrier experiments

Japan was different. When planning operations in the vast expanses of the Pacific, Japanese admirals place great expectations on submarine reconnaissance, able to operate several thousand miles from their bases. Radar had not been introduced yet, field of observation by periscopes was not big, so a submarine could only be considered a valuable observation platform when surfaced, and this was not always possible. Little wonder, then, that Japan was the first to begin series production of seaplanes able to cooperate with submarines, also their carriers.

Previous experience of the Japanese shipbuilding industry with submarines was not large, and the submarine fleet of the Imperial Japanese Navy consisted mostly of small foreign submarines, including some built under licence with help of foreign specialists. The first post-WWI development plans of 1921-1925 also aimed in this direction. Navy and private shipyards built F-class (FIAT-Laurenti, Italy), K-class (Schneider-Laubeuf, France) and L-class (Vickers, Britain) submarines.

At the end of 1918 the Imperial Japanese Navy HQ was very interested in German experience. They were most interested in the *U-139*, *U-141*, *U-142* and *U-150* long-range submarine cruisers. After the victorious war against Russia, 1904-1905, the Japanese controlled half of the Sakhalin peninsula and also Manchuria and Korea, which strengthened the empire economically and politically. Participation in WWI on the side of Entente gave Japan former German colonies in China, and in the Caroline and Marshall Islands. Thus the Japanese Navy received bases in the very centre of the Pacific. All these successes led to a growing imperial appetite in the high command of the Japan. Using the slogan 'Asia for Asians', Japan wanted to control a quarter of the globe, from the Aleutians in the north to Australia in the south, from America in the east to Africa in the west. Such a vast expanse of the theatre of operations required significant expansion of reconnaissance technology, and this could be long-range and long-endurance ocean-going submarines. Only the German submarine cruisers could meet the requirement.

Japanese military missions sent to Germany were instructed to acquire as much information about submarines there as possible, and representatives at international conferences were ordered to use every method to acquire one or two captured submarine cruisers. Much to the disappointment of the Japanese admirals it was only possible to obtain seven medium German submarines, although these included the relatively large *U-125* submarine minelayer, and *U-43* and *U-51* submarine cruisers. Additionally, it was found that the larger ships had many technical problems. Professor Oswald Flamm, the chief designer of the German submarine cruisers, said after the war that neither he nor his colleagues managed to build a cruiser with proper degree of stability by the end of the war. '*Large ships, when submerged, often heaved from one side to another even by 55 degrees, and this not only affected the crew's condition, but also could bring it to nervous breakdown*'. Therefore the *U-142*, even with a special wooden belt added, did not have sufficient stability.

It was no wonder, then, that the January 1921 statement of Professor Flamm aroused interest in Japan, bringing the question of submarine stability to the focus. At the time a delegation from the Kawasaki shipyard under Ritsu Makino went to Germany with the proposal to purchase 'Professor Flamm's principle' together with sketches and calculations made by the Professor. Although the price quoted initially proved prohibitive, both parties reached an agreement within a few months and Ritsu Makino returned home with a safe of secret documents. Soon after his arrival a large group of Professor Flamm's collaborators, including engineers and technicians experienced in design and construction of German submarine cruisers, went to Japan. Also, Professor Flamm told the Japanese about the possibility of using reconnaissance aircraft and suggested that they should

waste no time and become interested in the 'forerunner' of Ernest Heinkel's design. From the Japanese view point such equipment on the submarine cruisers would stretch their reconnaissance capabilities. Therefore it was decided to put Professor Flamm's recommendation into action.

It should be noted that from the Japanese view point the very idea of a submarine-based reconnaissance seaplane soon gained a broader interpretation. From an 'airborne periscope' for the carrier submarine captain, it turned into a tactical asset. According to the new principle the submarine-based seaplane was going to be a 'long-range eye' for the high command, thus achieving the status of an operational and strategic reconnaissance aircraft.

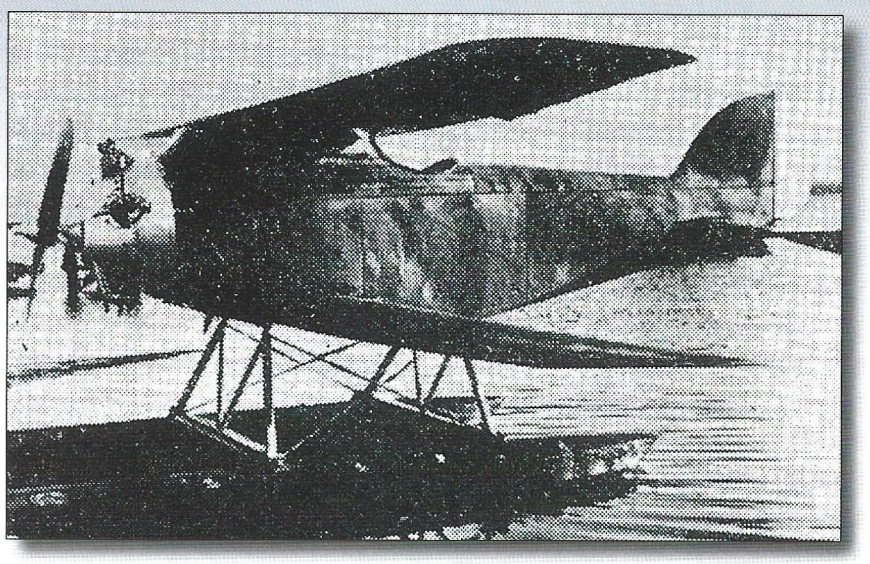
Besides, in 1921 the shipyard at Kure had started production of new class of KD large submarines, designed by the Naval Technical Institute based on the German *U-43* and *U-51* types. Soon afterwards, with help from German experts, construction of the *Jun Sen 1-Gata* submarines commenced, thus opening a long series of Japanese submarine cruisers.

The abbreviated name *Jun Sen* is an abbreviation of Japanese for *Jun-yo Sen-suikan*, meaning 'submarine cruiser'. From 1924 Japan adopted a four-class categorisation of submarines. The first class of ocean- and sea-going submarines with displacement of over 1,000 tonnes, *Itto Sensuikan*, was designated with the letter 'I'. This was followed by all submarines with displacement of less than 1,000 tonnes. The second class *Ni-to Sensuikan* was divided into two sub-classes: sea-going (designated *Ro*) and coastal (designated *Ha*). The third category included submarine minelayers, and the fourth small and midget submarines.

However, the first four submarines of the type had no seaplanes. This may have been due to the strong earthquake of 1923 which destroyed the principal Japanese arsenals. The first submarine cruiser *I-5* fitted to carry a seaplane was not built at the Kawasaki shipyards at Kobe until October 1929.

In July 1929 the keel was laid for the submarine *I-5*, developed by the design office of the Navy Technical Department, based on the *Jun Sen* predecessor ships. This submarine was the sole example of the J1M class, mainly characterised by the aircraft equipment. But the Staff of the Navy did not hide its dissatisfaction with the submarine cruisers, since these failed to achieve the planned range and cruising speed, and the results from trial seaplane operations were found unsatisfactory. The problem lay not just in the aircraft, but in the way it was stored on the ship. To avoid reduced stability with the hangar high on the deck, it was decided to split it in two separate parts, fitted within the superstructure as much as possible. For this reason they were located on both sides near the edge of the combat deck. The fuselage of the seaplane complete with the engine was housed in the starboard hangar, while wings and floats were in the port one. A deck-mounted crane was used for assembly and disassembly, and to hoist the aircraft on board, and following action it was stowed in a compartment on the superstructure. A broadened part of the deck aft of the hangars

Submarine I-5 with the starboard hangar visible. This was the first Japanese submarine aircraft carrier.



Caspar-Heinkel U-1 seaplane.

was used as the assembly area, where a pneumatic catapult should have been fitted according to the project.

By the time *I-5* was launched the catapult built by the Navy Arsenal at Kure was not ready, so the submarine was fitted with standard equipment that significantly hindered operation of the Yokosho E6Y1 reconnaissance seaplane. Take-off preparation time in such conditions was 30 to 40 minutes, or no better than during trials on *I-21* with the Caspar-Heinkel U-2 seaplane. This was due to the low position of the hangars, that were prone to flooding even in mildly stormy seas, making it difficult to pull out or assemble parts of the seaplane.

Take-offs of the E6Y1 seaplane from water continued for over a year, that is until the time when at the end of 1933 the Kure 1 Model 3 catapult was fitted, this being able to launch a seaplane weighing no more than 2,000 kg. Catapult take-off of the seaplane did little to improve aircraft preparation time and that was why the first Japanese submarine aircraft carrier only had her operational debut in 1935, when she participated in the blockade of China during the next stage of Japanese aggression on the continent. This could not be called strictly combat operations, however, as at the time the Japanese had complete control of the sea and air, without encountering the enemy, and reconnaissance seaplanes from submarines were used mostly to detect unarmed steamships and junks attempting to reach the Chinese coast or fishing vessels.

The experience was promising and, regardless of the tragedy of the British submarine *M-2* that halted all tests in Europe and the USA, all subsequent Japanese submarine cruisers were built with aircraft equipment. In defiance of the opponents of such seaplanes in the West, all statements that these could not be used in naval theatres due to deployment of anti-aircraft defences connected with the merchant shipping network failed to impress the Imperial Japanese Navy admirals. Both the Pacific and Indian Oceans were not covered with such a dense network of communication routes, anti-aircraft defences were weak and few submarines were active there.

Each new batch of Japanese submarines was updated by improving the aircraft equipment systems, first of all by improved operating conditions for reconnaissance seaplanes. On the submarine *I-6* (*2-Gata* class), launched at Kobe shipyard in 1934, the container-hangars were modified with hydraulic jacks that allowed them to rise above the superstructure decking. This solution prevented flooding of the hangars and allowed aircraft maintenance under virtually any conditions, as long as the seaplane was able to get back safely from its operation.

Similar to the British Parnall Peto, the Japanese E6Y1 seaplane failed to impress with its performance and it therefore needed a replacement very soon. Anyway, the Japanese aircraft industry had grown out of its 'nappies', and help of foreign specialists was no longer useful. Therefore new specification was prepared at the *Kaigun Koku Hombu*. These required a two-seat seaplane fitted with radio for communication with the mother ship. And the seaplane should be light. The relatively unknown Watanabe Company, previously specialised in production of light training aircraft, was selected to meet these requirements.

The new seaplane was intended for *I-7* and *I-8 3-Gata* class submarine cruisers started in 1934, which differed significantly from their predecessors. These were double hull ships, much larger and with watertight bulkheads, with endurance of up to 90 days. However, the aircraft system on these submarines was virtually the same as in *I-6*, with a hangar on each side. This meant that the specification retrograde rather than moving forward, and it was therefore modified, stipulating that the reconnaissance seaplane should be placed in a single hangar.

The Watanabe seaplane prototype flew for the first time in February 1935, and was then transferred to the arsenal at Yokosuka for further trials. It has to be mentioned that the performance achieved was not bad, considering that trials continued until October, when production of the initial batch commenced, and in July 1936 the seaplane was accepted for service under the designation of E9W1. This unusual seaplane, of which about 30 were built, became the little workhorse in which Japanese submarine pilots of the Pacific war gained their first experience. By 1941 E9W1 seaplanes from *I-7* and *I-8* submarines took part in the interrupted Japanese-Chinese war. Unfortunately, no description of assembly/disassembly procedure of the E9W1 seaplane from the period is known. It is only known that record complete assembly times of two minutes thirty seconds, and disassembly times of a minute and a half were achieved during trials. But is that true? During the war submarine commanders complained about excessive take-off preparation times of the seaplane.

Japan was intensively preparing for war, but it was not clear who would be the adversary. War with Russia (as favoured by the Army) could only be waged on land, with other countries across oceans. Under the 'Third ship replacement programme' announced in 1936 the ocean-going *Otsu 1* class submarines (submarine cruiser *I-15* was the most well-known representative of the first series) were launched for the Japanese fleet of submarine cruisers in largest numbers. Anyway, these were the most successful designs among large torpedo submarines in Japan.

Double hulls of *3-Gata* class ships had light alloy skin and more powerful power plants, which allowed surface speeds of up to 23.5 knots with the same endurance. However, the most radical changes were introduced in the aircraft equipment, repositioning the hangar and catapult ahead of the conning tower. This resulted in better surface stability of the ship, which in turn made launching the seaplane at full surface speed easier.

In 1940 the Watanabe E9W1 biplane had become obsolete, so Kugisho designers under Mitsuo Yamada developed a new two-seat twin-float low wing monoplane for the *Otsu 1* class ships. It was accepted into service under the designation of E14Y1. An observer's flexible 7.7 mm (0.303 in.) machine gun was fitted in the rear cabin, similar to that in the E9W1 seaplane, and the first seaplanes were also fitted with bomb carriers for two 30 kg bombs. With the guns and ammunition magazines removed the seaplane was able to take up to two 77 kg bombs. Thus the seaplane, previously intended solely for reconnaissance, could be used for bombing attacks.

The assembly and disassembly system seemed relatively simple at first sight, and the seaplane could take-off pretty quickly. But at sea all these operations were becoming very difficult to perform, especially when the ship was at full speed. Preparing the engine, mainly warming it up, took a lot of time. While launching the seaplane from a catapult was relatively simple and could be performed virtually in all weather, hoisting the aircraft aboard often proved very difficult. Waves could not be higher than 0.7-0.9 m for the tiny seaplane to alight safely. In rough seas even just taxiing the seaplane towards the submarine and hoisting it with a crane bordered on acrobatics. Nevertheless, especially in a submarine aircraft carrier seen as a long-range ocean-going reconnaissance system, the seaplanes were a great hope for the admiralty, and especially for Admiral Isoroku Yamamoto.

Submarine-installed aviation equipment

The submarine *I-5* was equipped with two cylindrical, waterproof hangars located just aft of the conning tower and housing a folded E6Y1 seaplane. In May 1933 *I-5* was equipped with a *Kure Shiki 1-Go 2-Gata* aircraft catapult built by the Kure arsenal and installed on the aft deck in place of an AA gun. The *I-5* was the first Japanese submarine equipped with waterproof hangars and a catapult for a reconnaissance aircraft.

In 1940 the submarine *I-6* underwent modification, including installation of an aircraft catapult (*Kure Shiki 1-Go 3-Gata*) just behind the conning tower. Such location of the catapult avoided problems caused by wave splashes during take-off. On the submarines *I-5* and *I-6* the seaplane took-off sternwards. The *I-6* was also equipped with two waterproof cylindrical hangars just aft of the conning tower, which were raised and lowered by electrical jacks and housed a Yokosho E6Y1 reconnaissance seaplane. In 1940 catapults were removed from decks of *I-5* and *I-6* and the submarines were never equipped with seaplanes in their subsequent careers.

On the submarines *I-7* and *I-8* catapults and hangars were located in the same place as on *I-5*, but the catapults were of a newer type, *Kure Shiki 1-Go 3-Gata Kai* on *I-7*, and *Kure Shiki 1-Go 4-Gata* on *I-8*. Both submarines were equipped with Watanabe E9W1 reconnaissance seaplanes.

The aircraft catapult *Kure Shiki 1-Go 4-Gata* was driven pneumatically and fitted with an additional gunpowder booster assisting the take-off in its initial phase. The propulsion gear was installed in a waterproof cylinder. The four-wheeled take-off trolley rolled over take-off rails with U-shaped cross-section. After take-off brackets supporting the seaplane folded and the trolley returned to its initial position. According to the manual the entire operation, including surfacing, preparation to take-off, take-off and submersion, should last no longer than fifteen minutes.

From July 1942 all Ko-class (*I-9* to *12, 15, 17, 19, 21, 23, 25* to *39*) and *Otsu*-class submarines (*I-40* to *45, 54, 56* and *58*) were equipped with *Kure Shiki 1-Go 4-Gata* catapults, and Watanabe E9W1s were replaced by Kugisho E14Y1s.

Technical specification of deck catapults

Model	Kure *Shiki 1-Go-2 Gata*	Kure *Shiki 1-Go 3-Gata*	Kure *Shiki 1-Go 4-Gata*
Total weight, kg	7,600	7,920	
Take-off rail			
Total length, m	16.0	17.0	19.0
Track width, m	0.95	0.95	0.9
Max. height, m	1.092	1.092	
Effective take-off distance, m	12.8	13.5	15.0
Braking unit			
Braking distance, m	1.2	1.5	
Propulsion	hydraulic	hydraulic	pneumatic
Max. take-off speed, m/s	24.6	25.0	26.0
Average acceleration, G			2,5
Propulsion	compressed air	compressed air	compressed air + gunpowder booster
Type of pneumatic unit	piston compressor	piston compressor	
Catapult readjustment	manual	manual	manual
Type of catapult	fixed	fixed	fixed
Location	behind conning tower	behind conning tower	in front of conning tower
Type of catapulted seaplane	E6Y1	E9W1	E9W1 and E14Y1
Submarine class	*I-5*	*I-6*	
Notes:			Take-off trolley fitted with holding brackets

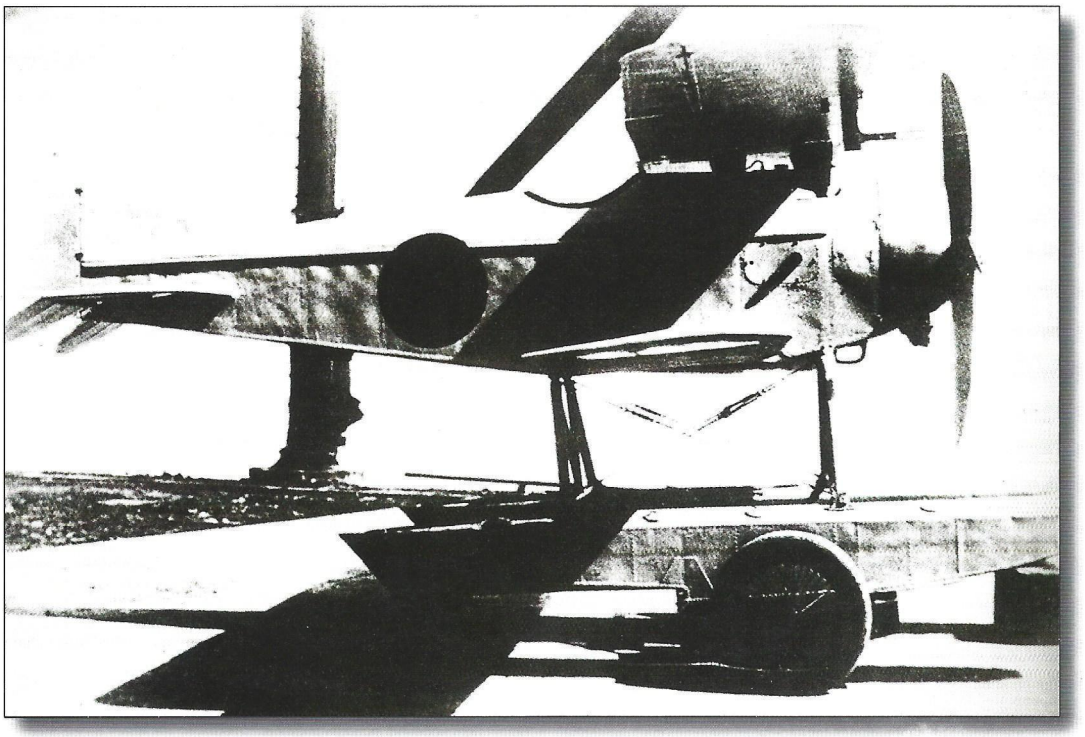
Japanese reconnaissance seaplanes on submarines

Yokosho 1-Go

Since the early 1920s the Imperial Japanese Navy was interested in using reconnaissance seaplanes from submarines, based on the European and American experience. The Navy HQ wasted no time. The Caspar-Heinkel U-2 submarine-based reconnaissance seaplane purchased in 1923 from the Caspar works was handed over to the Yokosuka *Kaigun Ko-sho* (Navy Aircraft Arsenal) at Yokosuka, known as Yokosho in short, where the engineers took their time to analyse its design. Work on the first Japanese submarine-based seaplane commenced in 1925 under the designation of Yokosho 1-Go, based on the Caspar-Heinkel U-2. This latter seaplane was designed by Ernst Heinkel, and the Hanseatischen Flugzeugwerke aircraft factory that built it was owned by Karl Caspar.

The twin-float seaplane developed by Yokosho was a single-seat cantilever biplane, with the upper wing fitted above the fuselage without interplane struts. It had mixed construction, with the trusswork fuselage welded from steel tubes, and wooden wings. Both floats and wings were detachable from the fuselage and could be housed together in a watertight tubular deck hangar 7.4 m long and 1.7 m in dia. The seaplane could be erected by five fitters within 4 minutes, and the total aeroplane preparation time from the surfacing of the submarine until take-off was 15-16 minutes. Disassembly could be accomplished by the same fitters within 2 minutes. Of course these were the times achieved in workshops on land. Whether the same could be done on the ship was going to be verified later, when in 1928 the *I-21* submarine minelayer was allocated for trials.

The first prototype (which later proved to be the only one) was built in 1927 and received the designation of Yokosho 1-Go. This was the smallest Japanese single-seat combat aeroplane. In spite of its small size, the aeroplane featured a very strong fuselage, aluminium-covered forward and fabric-covered in the tail section. The wing and tail surfaces were of wooden construction, fabric-covered. A 64 litre fuel tank was fitted in wings, providing two-hour endurance. Flat-bottom floats were of all-metal construction. The aeroplane was powered by a licence-built 80 hp Le Rhône 9C,

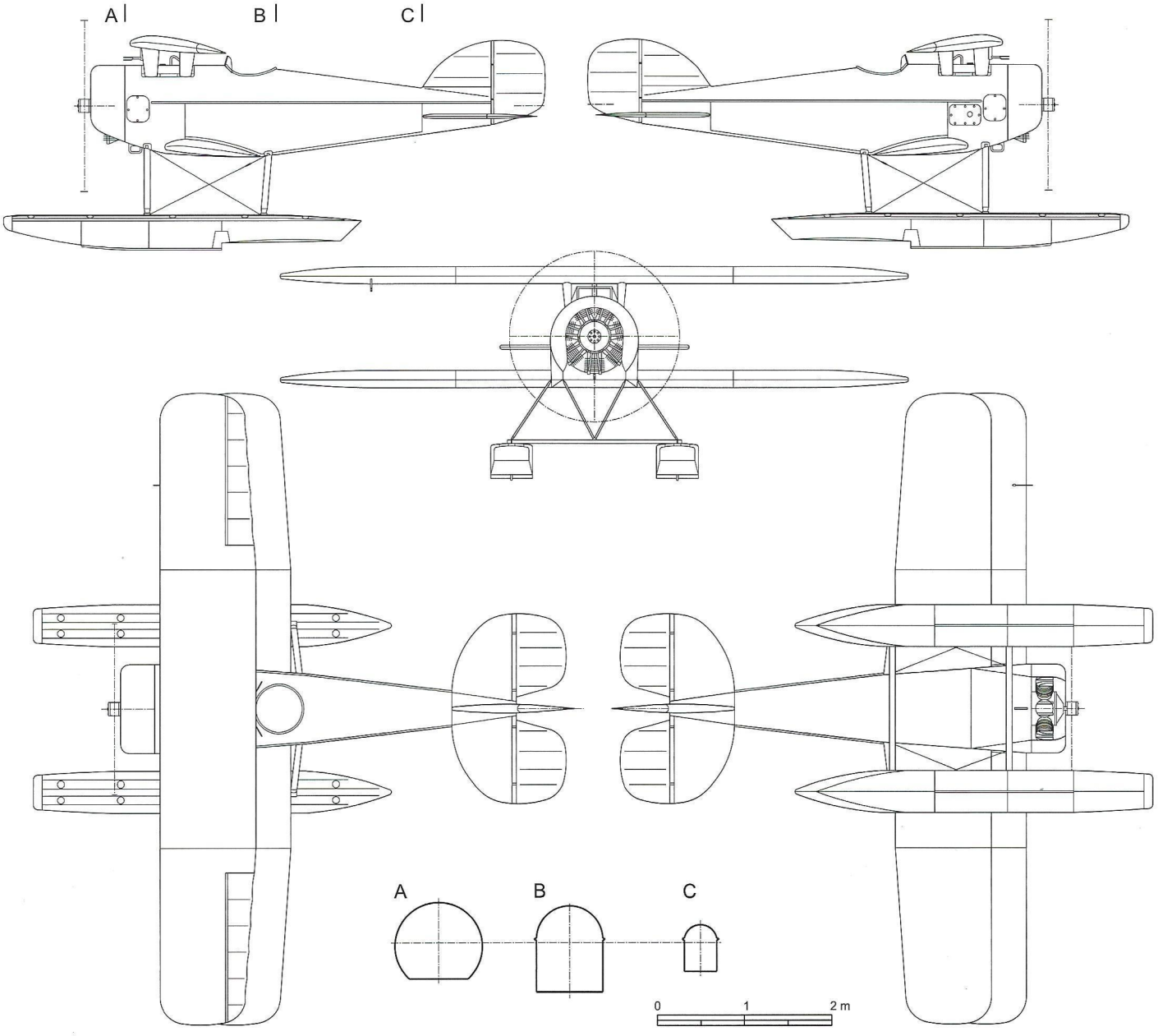


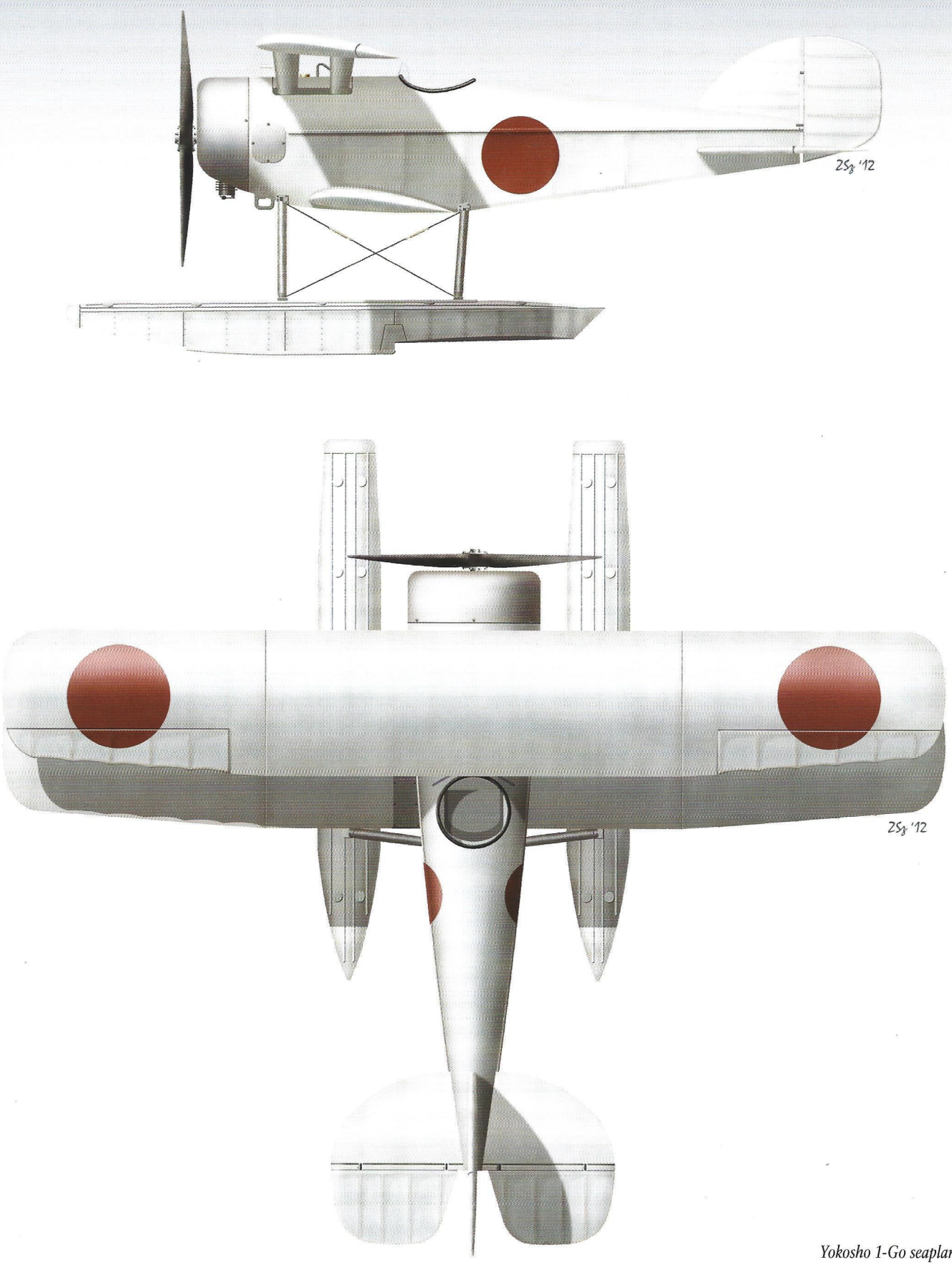
The sole prototype of the Yokosho 1-Go reconnaissance seaplane. It was powered by the 80 hp Le Rhône 9C, a French 9-cylinder radial engine licence-built by Gasuden, a Japanese engine company, and driving a wooden four-blade fixed-pitch propeller.

a French nine-cylinder rotary engine, driving a 1.95 m wooden four-blade fixed-pitch propeller. The engine, built by the Japanese Gasuden company, gave the aeroplane a top speed of 154 km/h.

During 1927-1928 the Yokosho 1-Go seaplane underwent extensive operational trials on board *I-21* (later *I-121*, one of four Japanese submarine mine layers) which was fitted with a water-tight tubular hangar on the deck. During trials the seaplane was hoisted onto the deck by a crane. During trials it was found that assembly and pre-flight preparations took up to 40 minutes, rather than 16, which was unacceptable. In general, the aircraft proved unsuccessful, as admitted by its designer himself. Moreover, the submarine's displacement proved insufficient for fitting of the seaplane hangar. Therefore, development of the Yokosho 1-Go was discontinued. The experience was used in the next reconnaissance seaplane, the Yokosho 2-Go, also intended for submarine operations

Yokosho 1-Go seaplane scale plans. 1/72 scale.





Yokosho 1-Go seaplane.

Yokosho 2-Go (E6Y1)

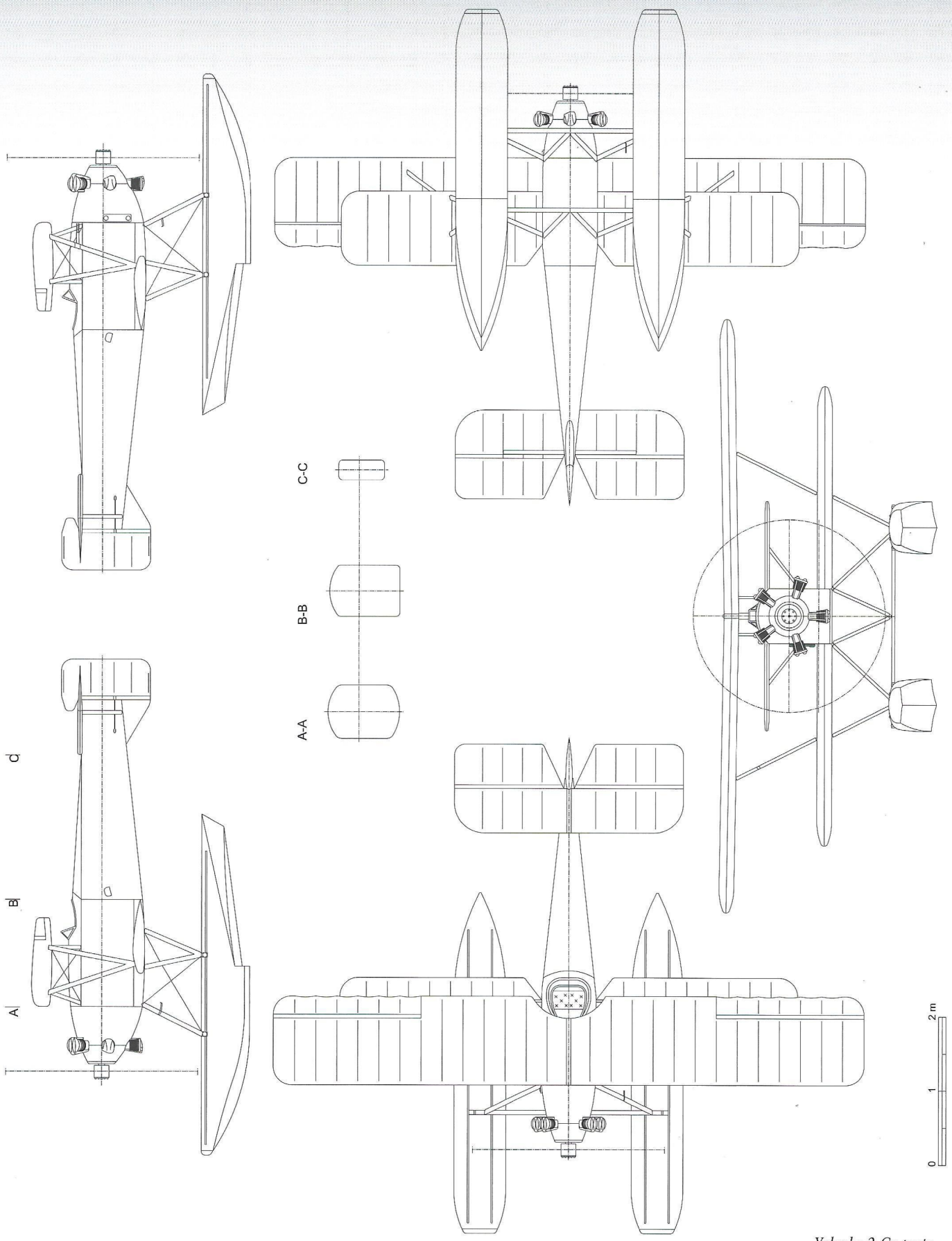
Upon completion of the Yokosho 1-Go flying trials, in 1929 the Imperial Japanese Navy HQ decided to fund a new programme for a submarine reconnaissance seaplane. This new programme was again entrusted to Yokosuka *Kaigun Ko-sho*. Development of the new design, designated Yokosho 2-Go, was entrusted to the team under Jiro Saha and Tamefumi Suzuki. As there were no plans in Japan to build submarines with a spacious hangar, like that in the British *M-2*, the reconnaissance seaplane was going to be designed as a single-seater, assembled and disassembled, rather than folding. The Yokosho 2-Go was based on the British Parnall Peto reconnaissance seaplane, powered by a 130 hp Armstrong Siddeley Mongoose. This aeroplane had been tested on the Royal Navy *M-2* submarine.

The Japanese project called for use of the 130 hp Hitachi *Kamikaze* 1 engine, but the first prototype used an Armstrong Siddeley Mongoose 130 hp five-cylinder radial, licence-built by Mitsubishi. The seaplane design itself had many changes with respect to the original they copied. It was a small twin-float seaplane, similar to the British one, but reduced in size. The fuselage construction was welded from metal tubes, fabric covered. Wings were of wooden construction, also fabric covered. In a submarine the seaplane was stored in a water-tight deck hangar. Wings and floats were detached and placed alongside the fuselage. The first prototype had inter-wing V-struts and non-standard tail. The fin was positioned under the fuselage, and the tailplane was located on top of the fuselage. Initially the floats had a wooden structure, subsequently replaced by duralumin. Overall size of the aircraft when disassembled allowed it to fit within a hangar 7 m long, 1.8 m high, and 3.5 m wide. Construction of the prototype Yokosho 2-Go was completed in May 1929 and *I-21* and *I-51* submarines were selected for trials, which lasted until September 1931. This seaplane was the first in Japan to be fitted with an HF radio set.

The results obtained allowed *Kaigun Koku Hombu* in 1931 to issue the specification *6-Shi* for the second prototype, which was designated Yokosho 2-Go Kai. This was powered by a 160 hp Gasuden *Jimpu* 7-cylinder radial. Several significant changes were introduced in the airframe, including N-shaped inter-wing struts, while the fin was retained in its original configuration. Production seaplanes received enlarged vertical tails with an upper fin. Flying trials of this improved prototype continued on *I-21* until the end of September 1931. Later on trials were conducted on *I-51*. Test results were considered satisfactory by the *Kaigun Koku Hombu* and in January 1932 the aircraft was approved for series production as the 'Type 91 Naval reconnaissance seaplane Model 1' (E6Y1 Model 1). Series production was entrusted to Kawanishi, where the aeroplane received the factory designation of Type N. A year later trials of the first catapult for the seaplanes were completed on submarine *I-51*.

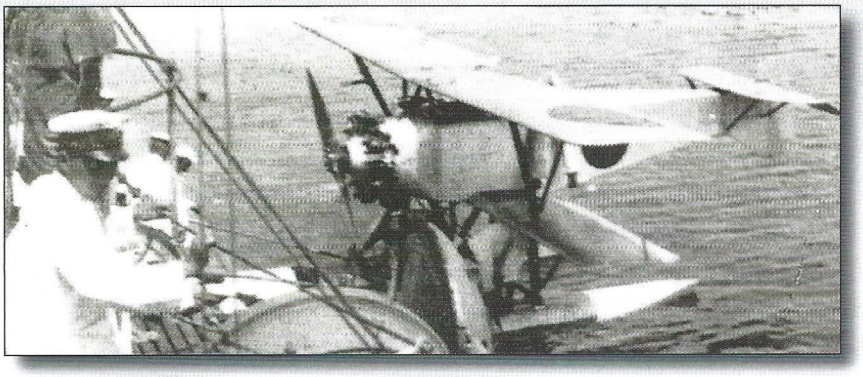
The E6Y1 was the first submarine-based reconnaissance seaplane to be officially accepted by the HQ of the Imperial Japanese Navy. At the same time Aichi built a prototype of a small reconnaissance seaplane, AB-3, similar in size and in performance, but it failed to find acceptance from the *Kaigun Koku Hombu*. Kawanishi started series production of the E6Y (Type N), after minor changes were introduced in the design, but only 8 machines were made, this being a result of the poor design and performance characteristics.

Construction of the *I-5*, the first Japanese submarine intended primarily to carry a seaplane, commenced in the summer 1932. According to production documentation two tubular containers were going to be fitted on the deck aft of the conning tower (separate ones for the fuselage and for the wings with floats) and the aircraft would be hoisted onto the water with a folding crane. This take-off method proved insufficient and in 1933 the *I-5* submarine was fitted with a pneumatic catapult. Later the seaplanes were used on the *I-6*, with displacement of 2,130 tonnes, based on the German *U-139* submarine from 1918. E6Y1 seaplanes were unarmed. According to some sources, E6Y1 seaplanes taking off from submarines took part in the 'Shanghai incident', and in the initial phase of the Japanese-Chinese conflict in early 1937, where they apparently carried out reconnaissance sorties in the Shanghai area. The seaplanes were also used on *I-7* and *I-8* submarines until



Yokosho 2-Go prototype scale plans. 1/72 scale.

replaced with E9W1 seaplanes during 1937-1938. The last E6Y1 seaplane ended its active service in the Imperial Japanese Navy in May 1943.

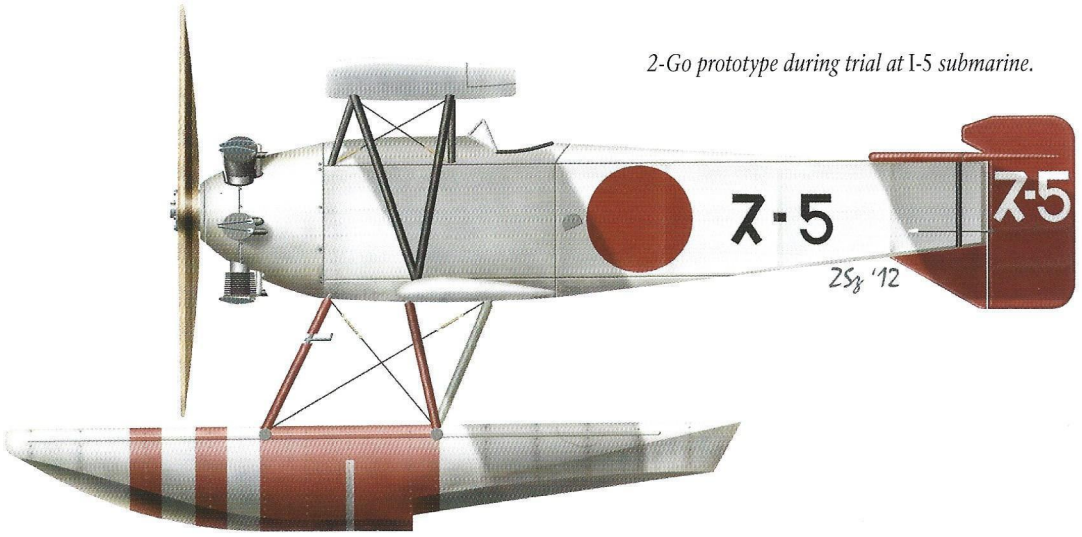


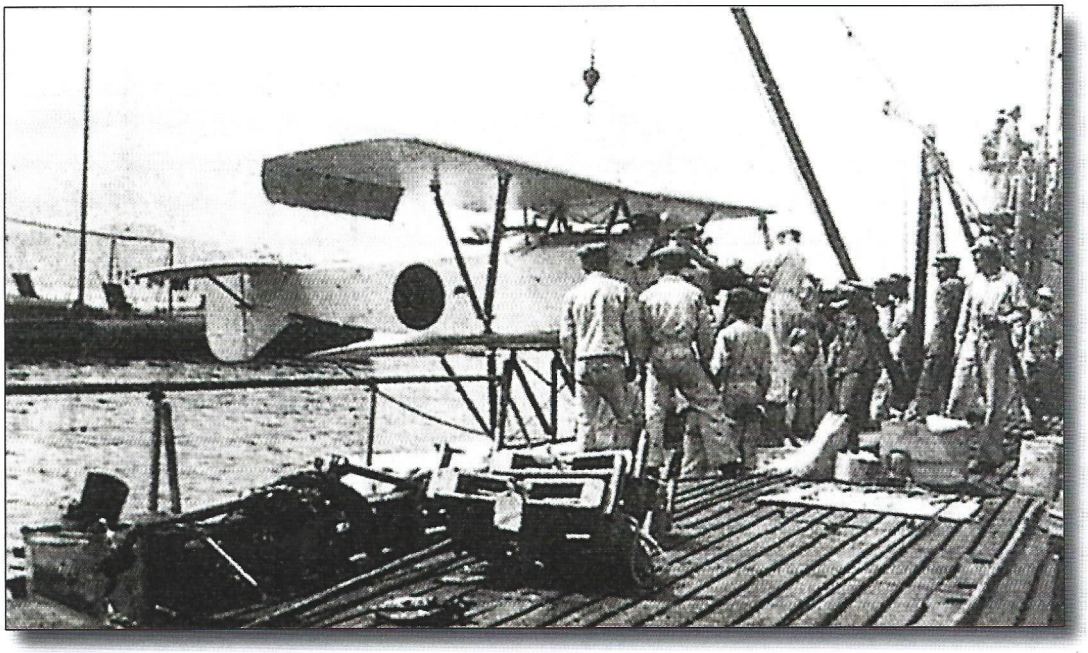
The first prototype Yokosho 2-Go seaplane lowered onto water from the submarine I-5.

Production – a total of 10 seaplanes was built, including:
by Yokosuka *Kaigun Ko-Sho* (Yokosho) at Yokosuka:
1 – prototype Yokosho 2-*Go* (1929)
1 – prototype Yokosho 2-*Go Kai* (1931)

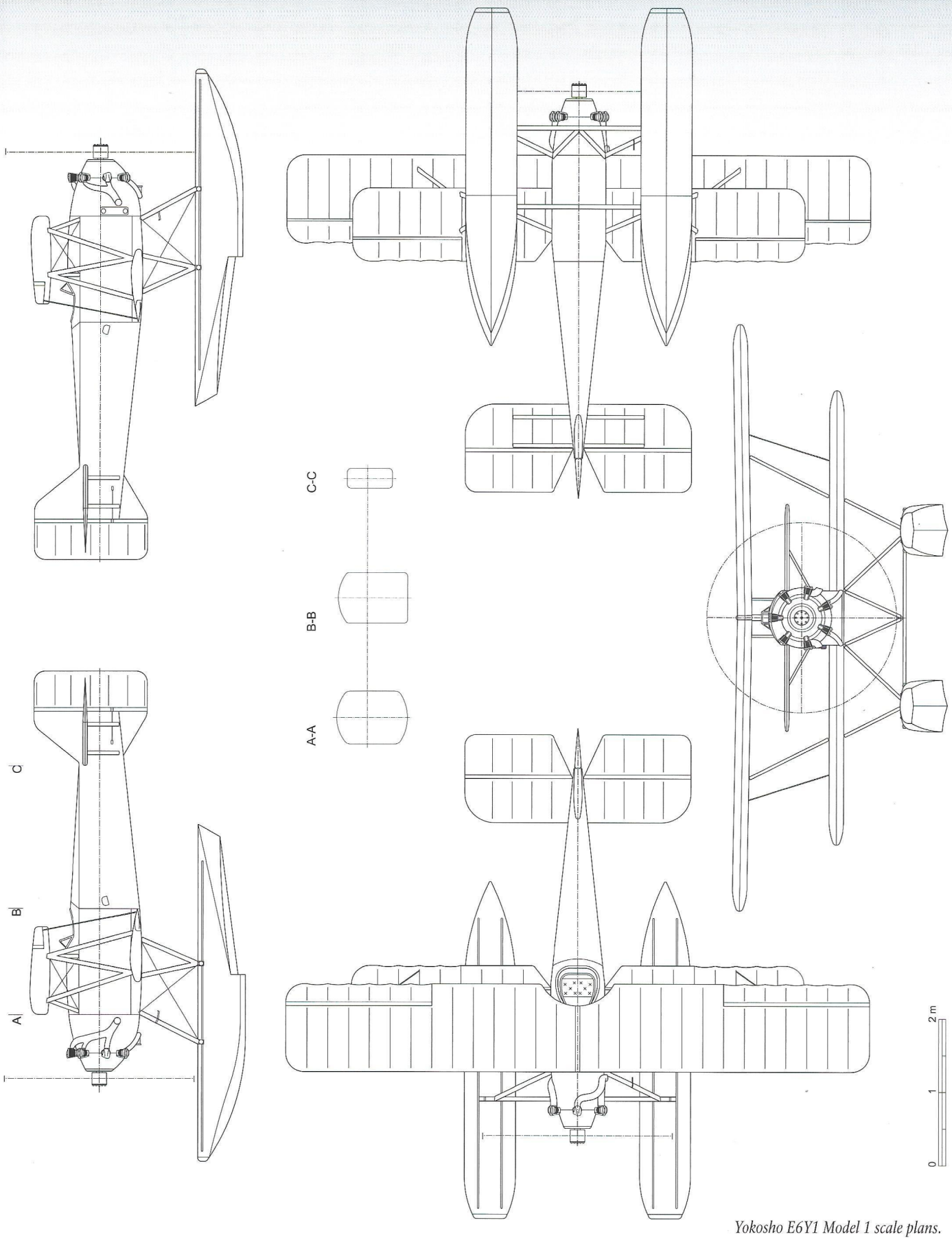
by Kawanishi *Kokuki Kabushiki Kaisha*:
8 – series production Type 91 (E6Y1 Model 1), 1932-1934

2-Go prototype during trial at I-5 *submarine.*



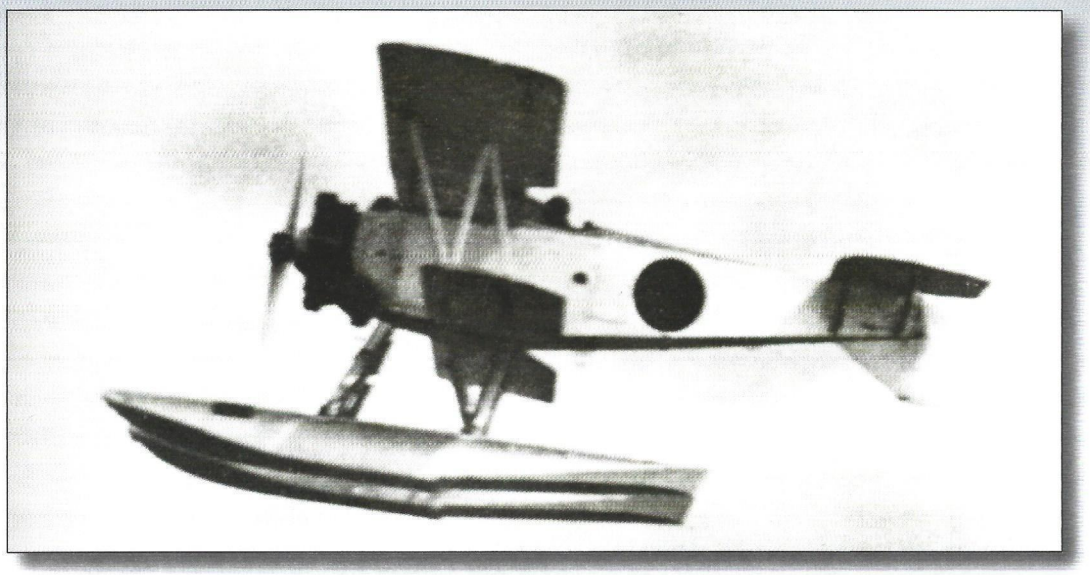


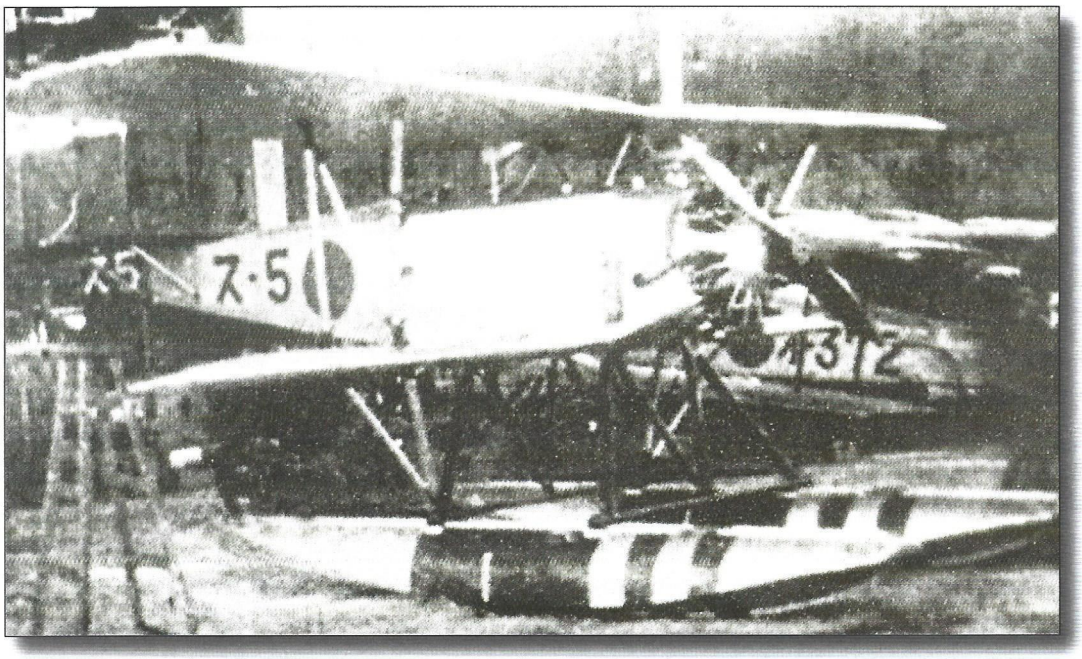
The first prototype Yokosho 2-Go seaplane during trials on the submarine I-5. *The prototype had an inverted fin and inter-wing V-struts. It was powered by the Armstrong Siddeley Mongoose 130 hp five-cylinder radial, licence-built by Mitsubishi.*

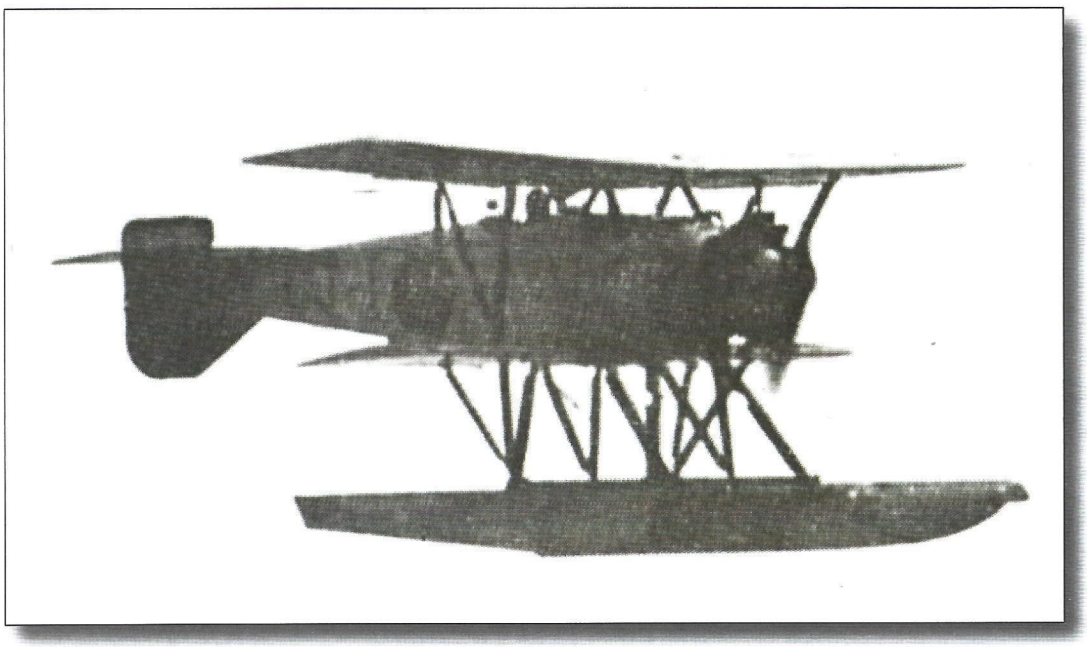


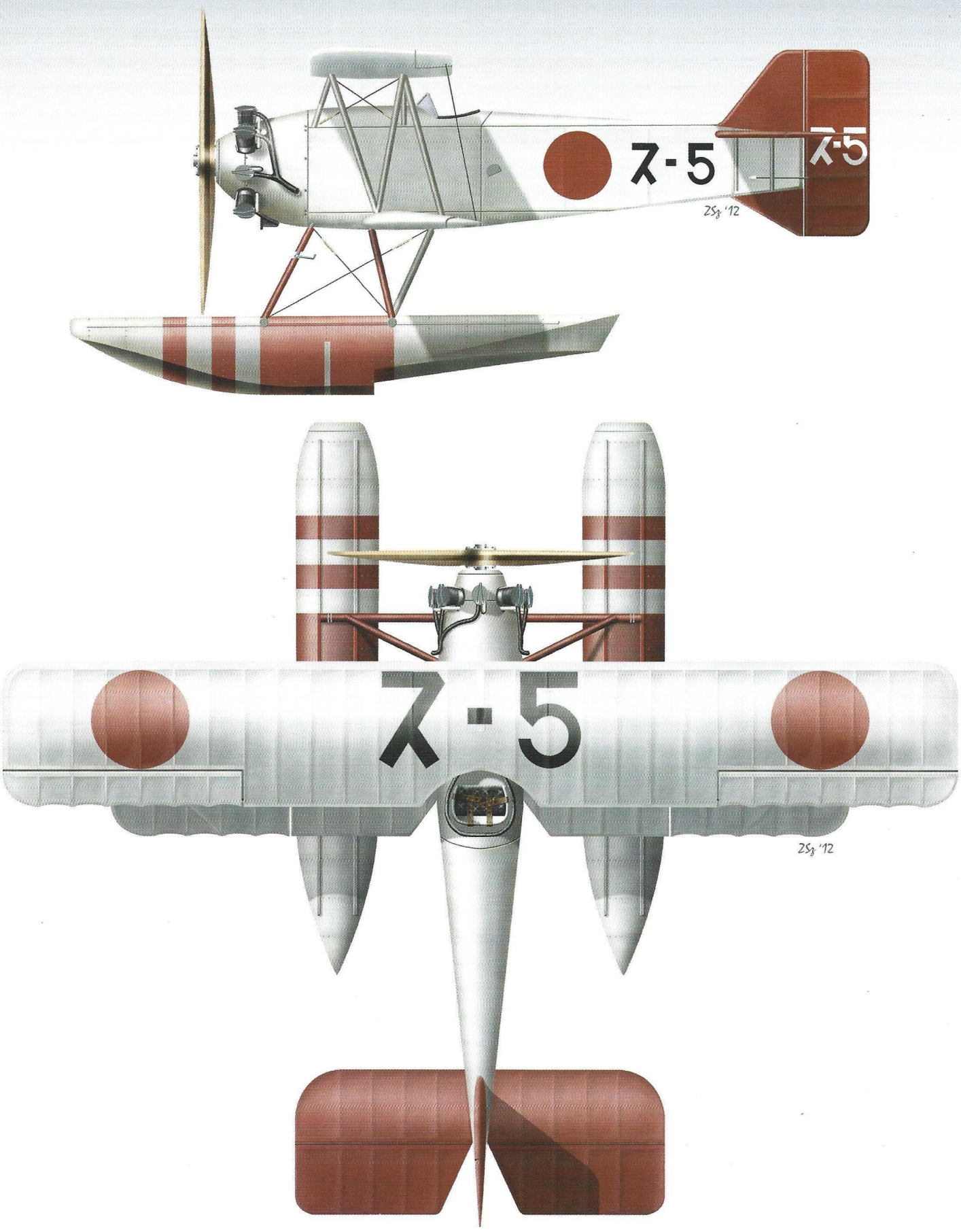
Yokosho E6Y1 Model 1 scale plans.
1/72 scale.

Three photos of the modified second prototype Yokosho 2-Go Kai seaplane. N-shaped inter-wing struts were introduced and the 160 hp Gas-uden Jimpu *7-cylinder radial was used.*









Yokosho E6Y1 Model 1 as embarked on submarine I-5.

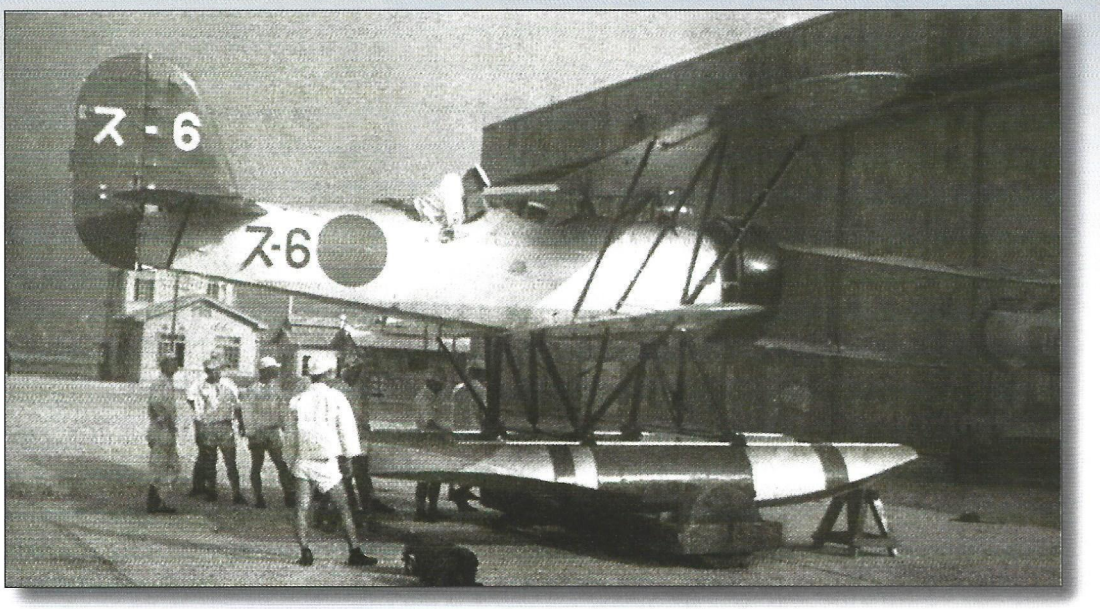
Watanabe E9W1 (Slim)

From January 1934 the Imperial Japanese Navy commenced construction of large submarines, offering quite high speed and long range, known as the *Jun Sen 3-Gata* (*I-7*, *I-8*). These would be the flag-carriers of the submarine flotilla. Due to their size, they were able to carry a two-seater reconnaissance seaplane. This required that a suitable seaplane be developed for these boats. For this, specification *9-Shi* was prepared, based on previous operating experience. This specification called for a two-seat, twin-float aeroplane of small size (dictated by the size of the deck hangar) and sturdy, lightweight construction. Wing span had to be such that when folded the seaplane would fit in a deck hangar some 2 m in diameter, with the fuselage length as short as possible. Moreover, the number of metal parts prone to corrosion and requiring labour-consuming protection had to be reduced to a minimum. It was suggested that a radial engine be used, to facilitate maintenance and operation.

Under the competition the *Kaigun Koku Hombu* handed the *9-Shi* specification to a number of companies. An opportunity to develop such a seaplane was also given to Watanabe. Ryohachiro Higuchi became the chief designer of the *9-Shi* project at Watanabe. Work on the initial projects continued in competing companies, too. Once they were completed and submitted for evaluation, the *Kaigun Koku Hombu* chose the Watanabe project as the best. This was mainly thanks to the promising calculated performance figures. Work on the project proper commenced in March 1934 and was shrouded in utmost secrecy, as the Navy HQ did not want anybody to know about the aeroplane which, carried by submarines, could appear in virtually every part of the globe as a nasty surprise for the enemy.

The first of four prototypes on order was built in August 1934, under the designation of '*9-Shi* Experimental small naval reconnaissance seaplane' (E9W1). This was an airframe intended solely for structural tests, the first stage of which was completed by November. A complete prototype was not built until February 1935, first flight taking place at Najima, a Kure Kokutai naval base near Fukuoka. As per the specification this was a small seaplane with two small conventional floats. Power was provided by the Hitachi GK2 *Tempu* 11 (Ha-22-11) radial rated at 340 hp for take-off, driving a 2.60 m two-blade wooden fixed pitch propeller. A 250 l fuel tank was fitted in the wings. The engine featured a NACA cowling enclosing a rather large exhaust manifold ring. The

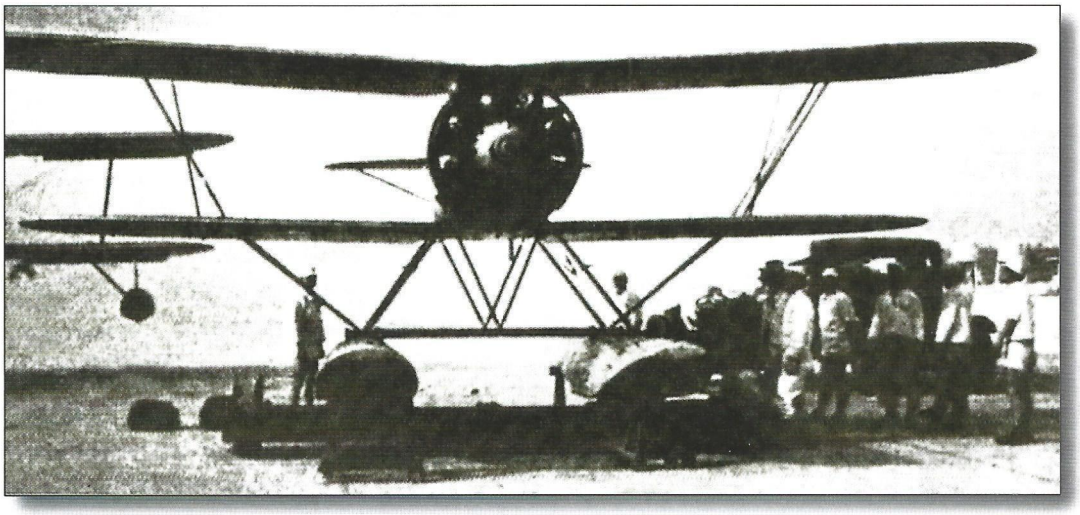
Watanabe E9W1 prototype reconnaissance seaplane from the submarine I-6 *during ground trials of the engine on Kure Kokutai berth in 1937.*



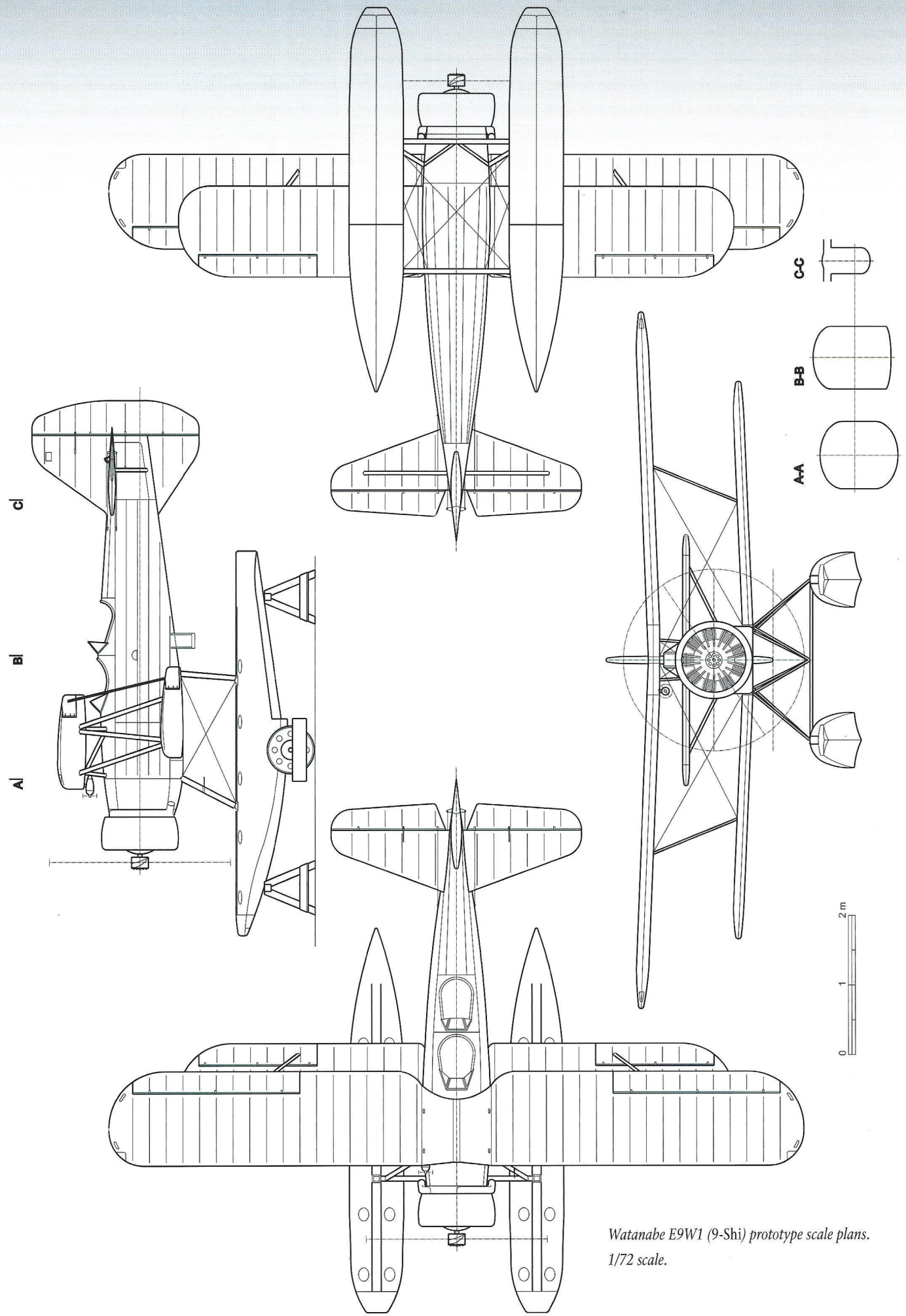
Side view of a Watanabe E9W1 Model 1 seaplane from the submarine I-6 at Kure Kokutai base during technical inspection in 1937.

fuselage trusswork was welded from thin-walled metal tubes, aluminium covered in the nose part, and plywood- and fabric-covered aft of the first wing centre section strut. The cockpit was located in line with the upper wing. The observer's position was immediately aft, armed with a 7.7 mm (0.303 in.) Type 92 machine gun and fitted with a radio set for communication with the parent submarine. Aft of the cockpit the elliptic fuselage cross-section changed to a rectangular one, ending with a round-tip fin. The tailplane was tapered, with round tips, supported by struts underneath. Wings were untapered with round tips. Upper wing consisted of a short centre section, attached to the fuselage by a number of struts. Lower wings were attached directly to the lower part of fuselage. Wings were linked by inverted-N struts to achieve proper stiffness. Relatively large floats were attached to the fuselage and wings by streamlined struts and supports. The E9W1 was designed to be assembled and disassembled on a cruising submarine and held in her deck hangar. Only the principal parts of the aeroplane were to be disassembled.

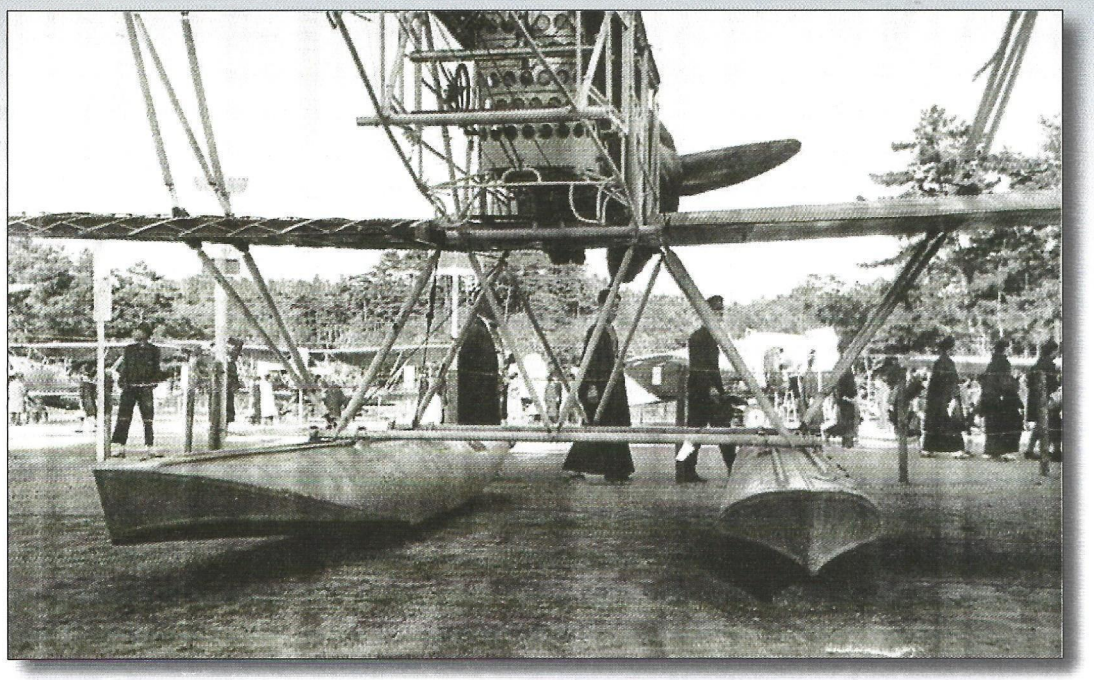
After completion of structural tests of the airframe and assembly of three prototypes, pre-series production commenced in October 1935. Flying trials continued until July 1936, mainly on board the submarines *I-5* and *I-6*. These were fitted with two hangars, a crane, and a pneumatic catapult. Initial flying trials indicated the new seaplane had little promise. Its longitudinal stability was very poor. It had a nose-high tendency, especially in gliding, and was prone to roll when flying straight and level. This was due to insufficient fin area. Attempts to introduce additional fins under the fuselage or on sides of the fuselage aft of the observer gave no satisfactory results. It was the enlargement of the fin area and height by 100 mm that solved the problem. This way the *9-Shi* specification requirements were met. Therefore, the *Kaigun Koku Hombu* officially accepted



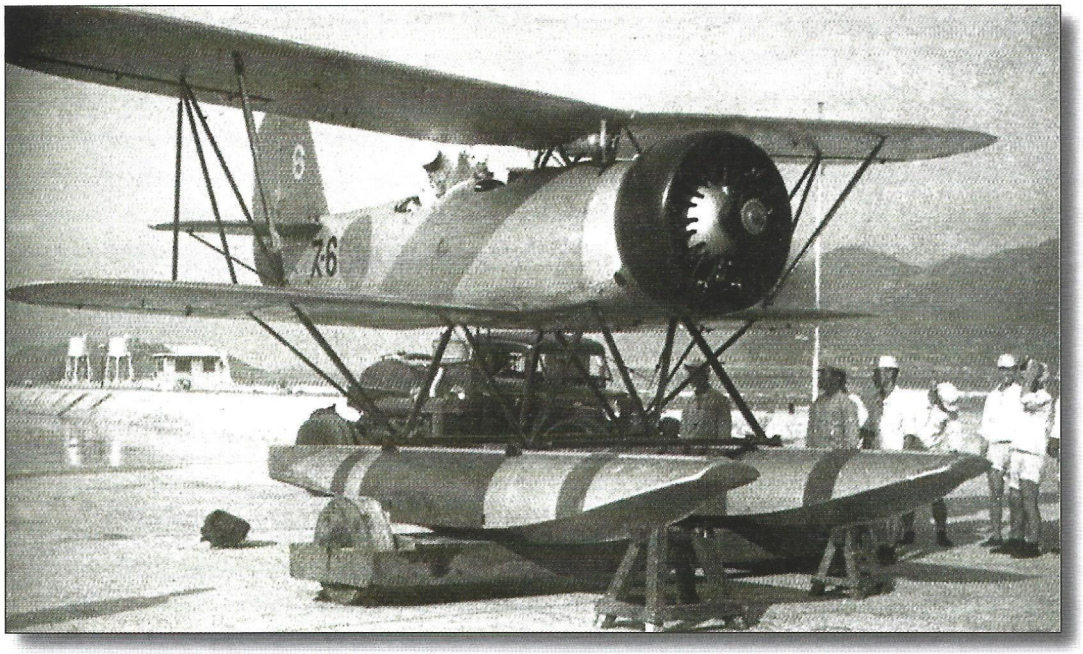
Front view of the E9W1, running its engine on the ground.



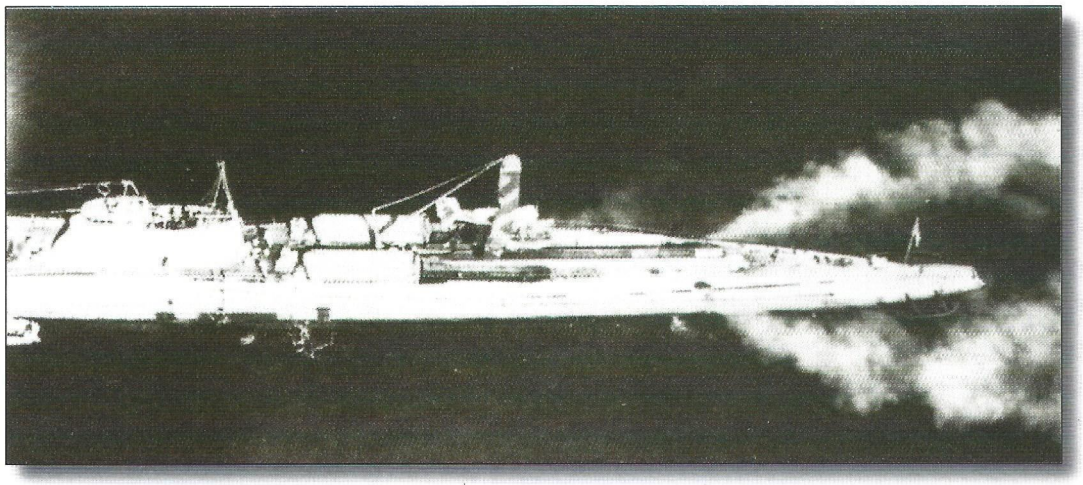
Watanabe E9W1 (9-Shi) prototype scale plans.
1/72 scale.



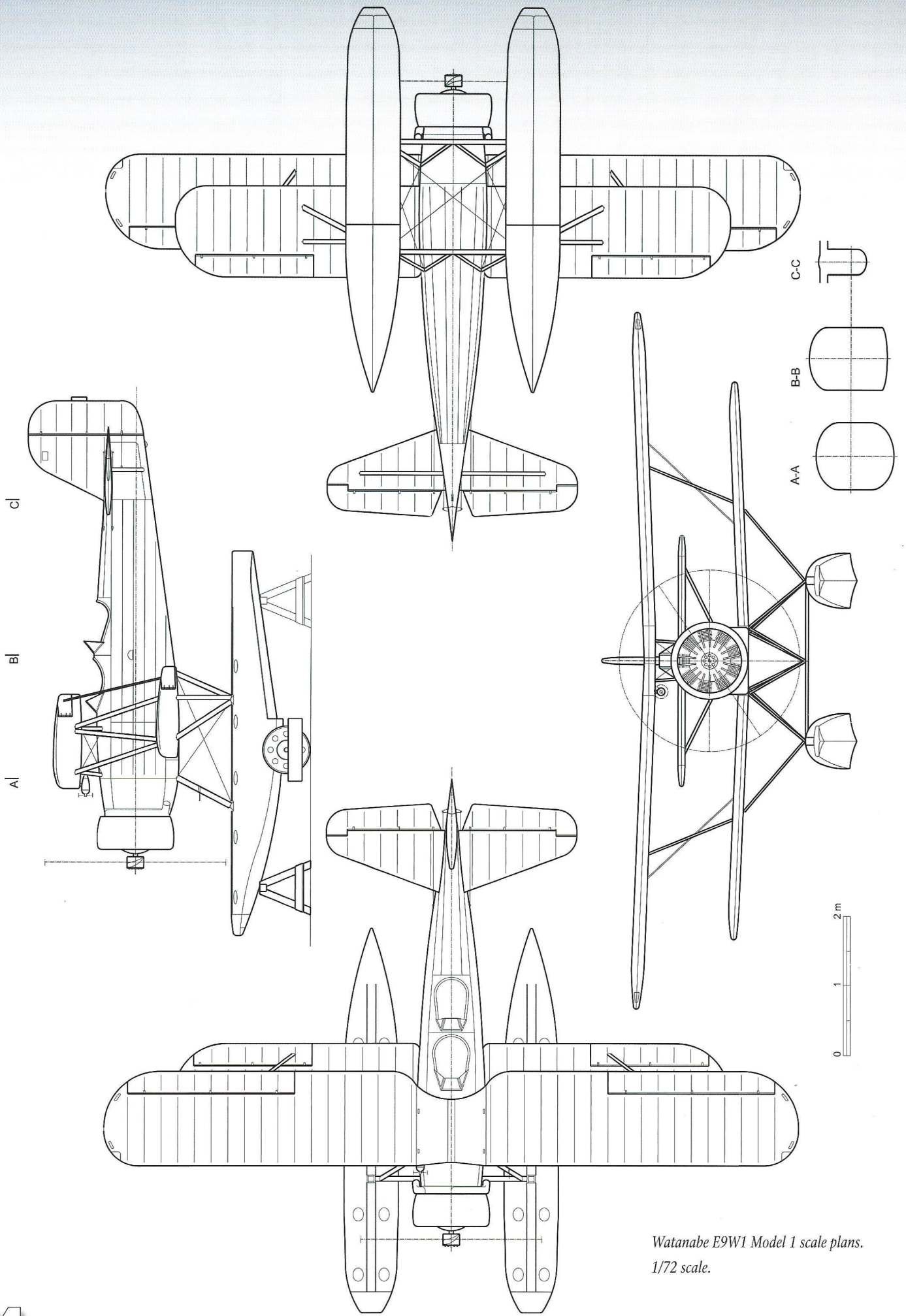
Rear view of the E9W1 seaplane skeleton. The float struts and float steps, as well as the fuselage trusswork with the observer's seat can be seen clearly. This was an exhibit at the exhibition of the Imperial Japanese Navy aeronautical equipment in 1940.



Watanabe E9W1 Model 11 reconnaissance seaplane from the submarine I-6.



Submarine I-6. A Watanabe E9W1 seaplane undergoes assembly on the catapult, and immediately aft of it are the two side-mounted hydraulically raised cylinder hangars. Note the irregular pattern of camouflage on the upper wing.



Watanabe E9W1 Model 1 scale plans.
1/72 scale.

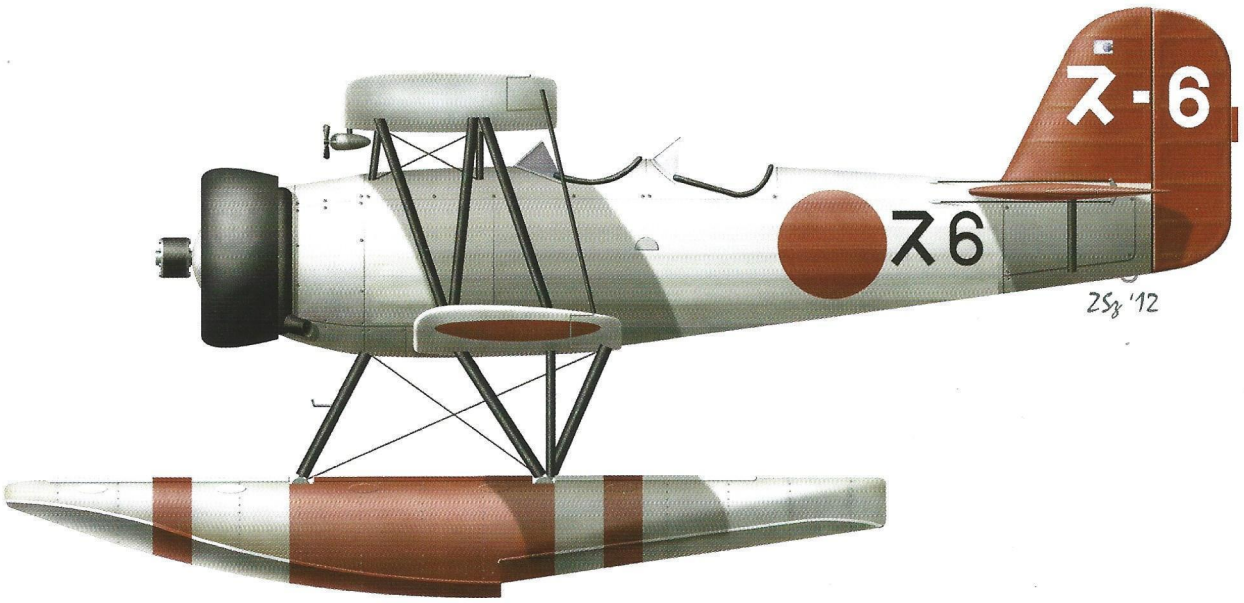
the seaplane for series production under the designation of 'Type 96 Small naval reconnaissance seaplane Model 1' (E9W1 Model 1).

Production E9W1 seaplanes were almost identical to the prototypes. They differed slightly in the struts between the floats and the fuselage, and the single strut under the tailplane. Introduction into service was delayed, mainly because of protracted adaptation work on the submarines. Also, insufficient maintenance crew for these seaplanes had been suitably trained by then. First production E9W1 seaplanes were delivered to the first two *Jun Sen 3-Gata* class submarines, the *I-7* and *I-8*. Subsequent seaplanes were delivered in 1937 to the *Jun Sen Ko* class and *Jun Sen Otsu* class submarines. Thirty two E9W1 production seaplanes were built, many of these serving on submarines for no less than six years. The seaplanes achieved their first operational success during the Japanese-Chinese war, operating from submarines the East China Sea during the blockade of China.

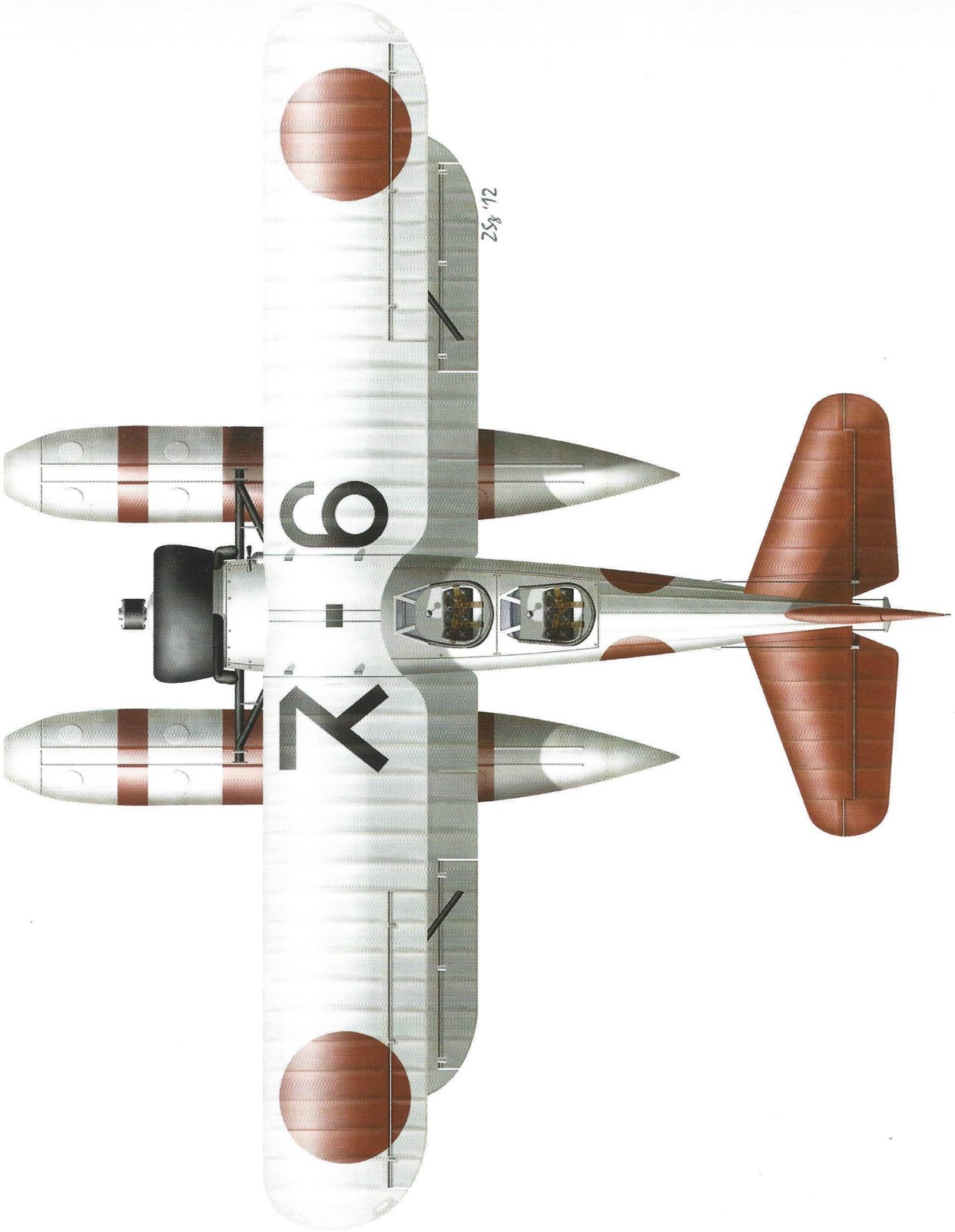
Before take-off from the submarine catapult, the seaplane was removed from its cylindrical hangar and placed on the catapult. Assembly involved two crew members and four fitters, led by a Petty Officer. The fitters started the engine while unfolding the wings. Initially the total time from the moment the submarine surfaced until the seaplane took off was one hour. After a few trials the crew gained experience and this was reduced to 40 minutes. After completion of its task the seaplane alighted near the ship and approached under her own power. Then the crane hoisted it on board and placed it back on the catapult rails. After the wings were folded and the floats removed, the seaplane was slid into its hangar. This operation, too, took an hour initially, but was later shortened significantly.

Due to their good flying characteristics, the E9W1 seaplanes were assigned by the Naval HQ to the ten ocean-going submarines, known as the 'submarine cruisers'. Using these seaplanes, though, required certain modification of the submarines, including fitting of the deck hangars and catapults. By the time the war in the Pacific started, most of the submarines were ready for operations with the seaplanes on board. In 1942 fourteen E9W1 seaplanes were still operational. These were part of the *Rengo Kantai* (Combined Fleet), equipping submarines *I-7*, *I-8*, *I-10*, *I-15*, *I-17*, *I-19*, *I-21*, *I-23*, *I-25*, and *I-26*.

The E9W1 seaplane was the first aircraft of this kind produced in series and used for reconnaissance for a prolonged period. Its existence became known to Allied intelligence only just before the outbreak of the Pacific war. It was subsequently code-named Slim. The E9W1 seaplane was also the last biplane to be used on board Japanese submarines. It was replaced in the second half of 1942 by the E14Y (Glen).



E9W1 Model 1 as embarked on submarine I-6.



E9W1 Model 1 as embarked on submarine I-6.

Operational units: submarines *I-7, 8, 9, 10, 11, 15, 17, 19, 21, 23, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, Saeki Kokutai, Maizuru Kokutai,* and probably the seaplane carrier *Chichijima Maru.*

Production: *Kabushiki Gaisha Watanabe Tekkosho* at Zasshonokuma built four prototypes and 32 production E9W1 seaplanes.

	Yokosho 1-*Go* (U-1)	Yokosho 2-*Go*	Yokosho 2-*Go Kai* E6Y1 Model 1	Watanabe E9W1 9-*Shi*	Watanabe E9W1 Model 1
Years of production	1927	1929	1931–1934	1935	1936–1939
Number of aircraft built	1	1	1 + 8	4	32
Crew	1	1	1	2	2
Engine type	Gasuden Le Rhone	Hitachi *Kamikaze 1*	Gasuden *Jimpu*	Hitachi GK2 *Tempu* 11	Hitachi GK2 *Tempu* 11
Engine power, hp	80	130	160	340	340
Fuel tank capacity, l	63			250	250
Airscrew diameter, m	1.95			2.60	2.60
Span, m	7.20	8.60/6.10	8.60/6.1	9.975	9.975
Length, m	6.205	6.80	6.80	7.635	7.635
Height, m	2.39	2.71	2.71		3.29
Wing area, m²	15.20	16.88	16.88	23.50	23.50
Empty weight, kg	400	522	570	880	880
Take-off weight, kg	520	750	885	1,250	1,250
Wing loading, kg/m²	34.21	44.43	52.43	53.19	53.19
Power loading, kg/hp	6.50	5.77	5.53	3.78	3.78
Maximum speed, km/h	154		168	232	232
Cruising speed, km/h			126	148	148
Landing speed, km/h			89	92	92
Time of climb, min to altitude, m		20'14" 3,000	17'55" 3,000	9'41" 3,000	9'41" 3,000
Service ceiling, m			3,320	6,750	6,750
Range, km				730	730
Endurance, hrs	2h		4 h 24'	4 h 66'	4 h 66'
Defensive armament (number x calibre)	none		none	1 x 7.7 mm	1 x 7.7 mm

Kugisho E14Y reconnaissance seaplane

Developing the E14Y1 seaplane followed from the 3rd Generation Development Plan (*Otsu 3*) of the Imperial Japanese Navy submarines, prepared in 1936. This included a requirement to develop 2,000 tonne *I-9* class long range ocean-going submarines. At the same time the *Kaigun Koku Hombu* prepared the *12-Shi* specification for a successor to the Watanabe E9W1, to equip these submarines.

12-Shi Sen-tei specification for a submarine-based reconnaissance aircraft

The *12-Shi* specification was made available, in the form of a competition, to the *Dai-Ichi Kaigun Koku Gijitsusho* (1st Naval Aircraft Technology Arsenal, known in short as Kugisho) at Yokosuka and to K.K. Watanabe Tekkosho at Zasshonokuma, with the requirement for close co-operation between the submarine and seaplane design teams. The entire programme was top secret.

According to the *12-Shi* specification the seaplane under development should meet the following requirements, among others:

- crew: two,
- wing span: no more than 11.00 m,
- all-up weight: less than 1,500 kg,
- landing speed with normal weight: no more than 48 knots (89 km/h),
- range with normal weight: no less than 600 nautical miles (1,111 km),
- take-off run with normal weight: no longer than 28 m,
- assembly and disassembly time: no longer than 10 minutes for removal from the cylinder hangar and assembly, and 10 minutes for disassembly of the seaplane and replacing it in the hangar, and to submerge following a reconnaissance mission;
- armament: one flexible 7.7 mm (0.303 in.) machine gun
- small wireless intercom,
- navigation system,
- deck hangar: cylinder, outer diameter 2.40 m, internal useable diameter 1.85 m, length 8.5 m.

The cylindrical hangar was going to be fitted centrally on the deck ahead of the conning tower. The seaplane was to be attached to the transport trolley, which would also serve for launching the seaplane from a pneumatic catapult. The take-off rails were going to be used both for take-off of the seaplane on its trolley and for rolling the disassembled seaplane in and out of the hangar.

Work on the Otsu-3 project at the Kugisho arsenal

In the Kugisho arsenal designwork on the new seaplane commenced under Mitsuhito Yamada, who also headed the design team. Overall control of the development work was given to Hajima Kato. While working on the specification, just two parameters were focused upon, as these were considered the most important for the future aircraft – landing speed on water in the range of 47-48 knots (87-89 km/h) and time required for assembly and take-off of the seaplane, not longer than 10 minutes. It was decided to accept all consequences of achieving these two parameters.

According to the *12-Shi* specification the seaplane was designed as a low wing monoplane on two floats. The project received factory designation *Otsu-3*. Wings had a two-spar structure with NACA 230 airfoil. For stowing in the hangar the wings were removed and laid alongside the fuselage, with ailerons and flaps deflected by approximately 180° to lie flush with the bottom wing surfaces. Rear fuselage was slightly raised to prevent catching the catapult rails during take-off. Tips of the tailplanes were folded upward and supported against the fin, while the struts were released from their catches on the tips of the tailplane and supported against the leading edges, thus reducing the width of the aircraft during storage. When the main planes were unfolded, floats were attached with inverted W-shaped struts, and the tailplane was stiffened with struts to the fin. Height of the fin was defined by the diameter of the cylinder hangar. Float struts consisted of two pairs of supports, forward and rear, and diagonal ones. These were very easy to assemble and disassemble with the floats. Special bolts with phosphorous covered ends were used to improve night visibility. Pilot's and observer's cockpits were semi-enclosed. The pilot and observer sat in separate cockpits in tandem. A flexible Type 92 7.7 mm (0.303 in.) machine gun manned by the observer in the rear cockpit was used for defence. The observer also operated the radio for communication with the parent submarine. The seaplane could also be fitted with two 30 kg bombs under the wings.

Time needed for assembly and take-off by experienced engineering crew was defined as no more than 10 minutes, but the record was set at 6 minutes 23 seconds. The aeroplane was powered by a 340 hp Hitachi *Tempu* 12 9-cylinder air cooled radial, driving a two-bladed wooden fixed pitch propeller. The same engine had been used to power the earlier Watanabe E9W1.

Competitive Watanabe E14W1 seaplane

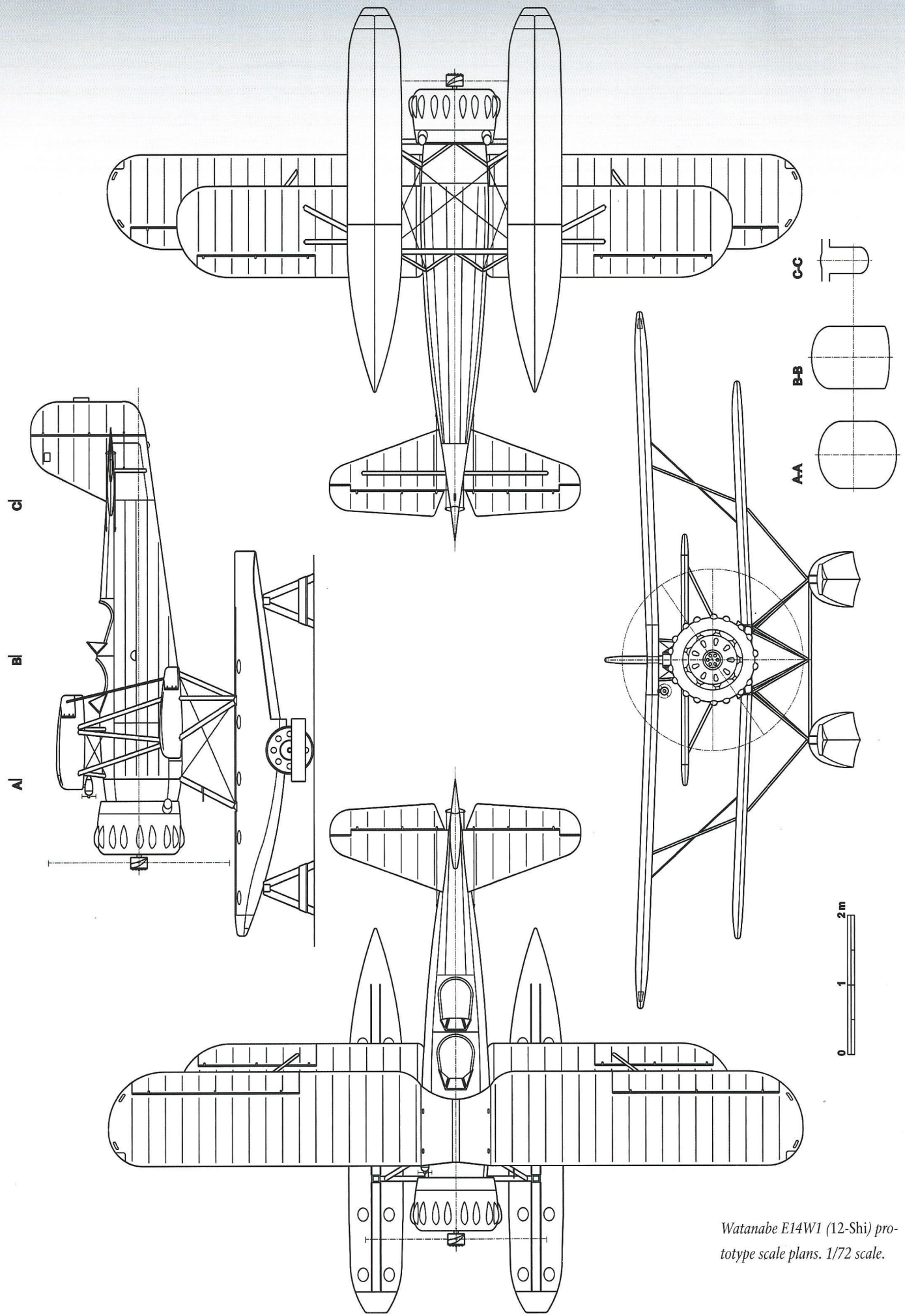
In parallel with the submarine-based reconnaissance seaplane developed by the Kugisho arsenal according to the *12-Shi* specification, Watanabe developed and built an experimental small reconnaissance seaplane, the history of which still has many unrevealed mysteries.

In late 1937 both design offices participating in the competition presented their preliminary projects for approval. The Kugisho arsenal presented their small low-wing seaplane, designated E14Y1, while Watanabe displayed what was essentially a development of the E9W1 biplane they were already making. It was planned to power it with the Hitachi *Tempu* 12 radial rated at 340 hp for take-off, housed in a NACA cowl.

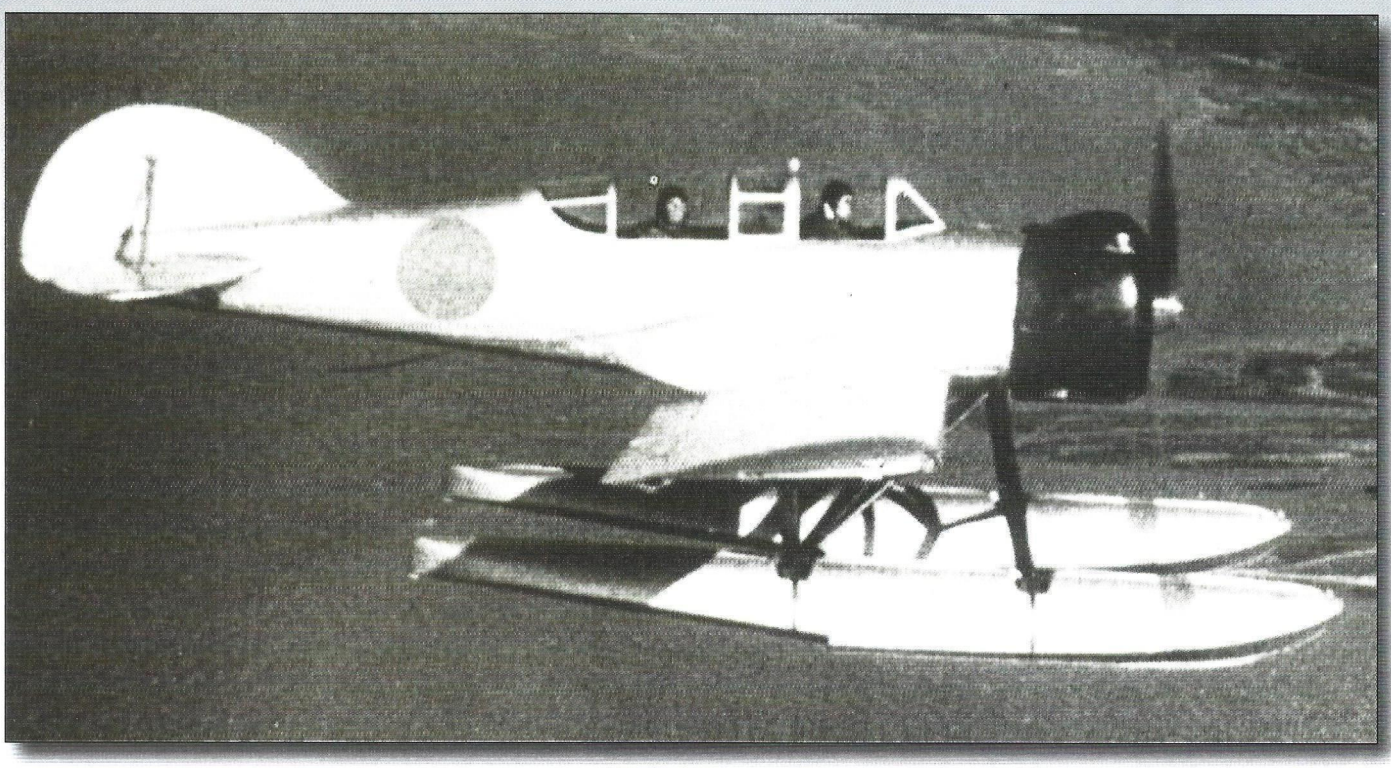
Following analysis, the technical committee of the *Kaigun Koku Hombu* approved both these projects for further development, as the comparison characteristics proved extremely difficult to decide. The Watanabe project was designated '*12-Shi* Naval experimental small reconnaissance submarine seaplane' (E14W1). A year after the *12-Shi* specification was published both companies completed construction of their prototypes and commenced flying trials. Initially the Watanabe E14W1 seaplane had a slight advantage over the competitor, which had insufficient fin area, and for this reason failed to handle correctly in the air, but after Kugisho designers introduced numerous changes in the design, the E14Y1 seaplane proved the better. Eventually, trials showed the superiority of the seaplane designed at Kugisho. Soon afterwards the E14Y1 seaplane was earmarked for series production, which was contracted to Watanabe.

The first E14Y1 prototypes, flying trials and problems connected with these

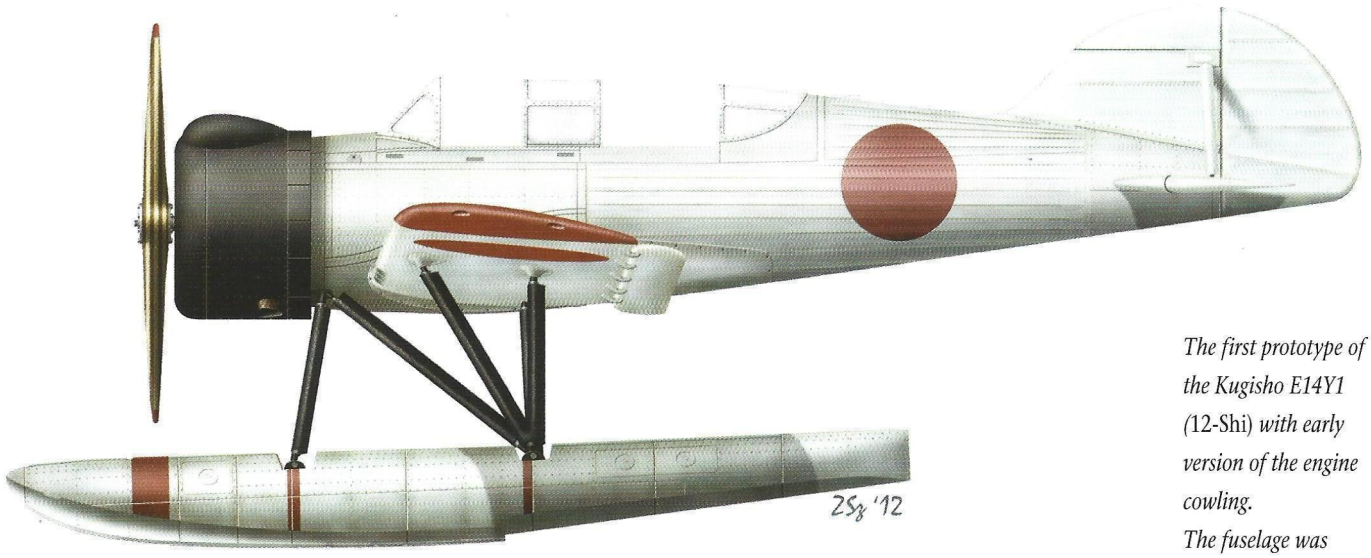
At the end of 1938, a year after the specification was drawn, assembly of the first two prototypes, designated '*12-Shi* Naval experimental small submarine seaplane' (E14Y1) was completed at Kugisho arsenal. The prototypes were first flown in 1939. One of these was flown over Tokyo Bay by Sub-Lieutenant Ohkane with observer engineer Hajima Kato.



Watanabe E14W1 (12-Shi) prototype scale plans. 1/72 scale.



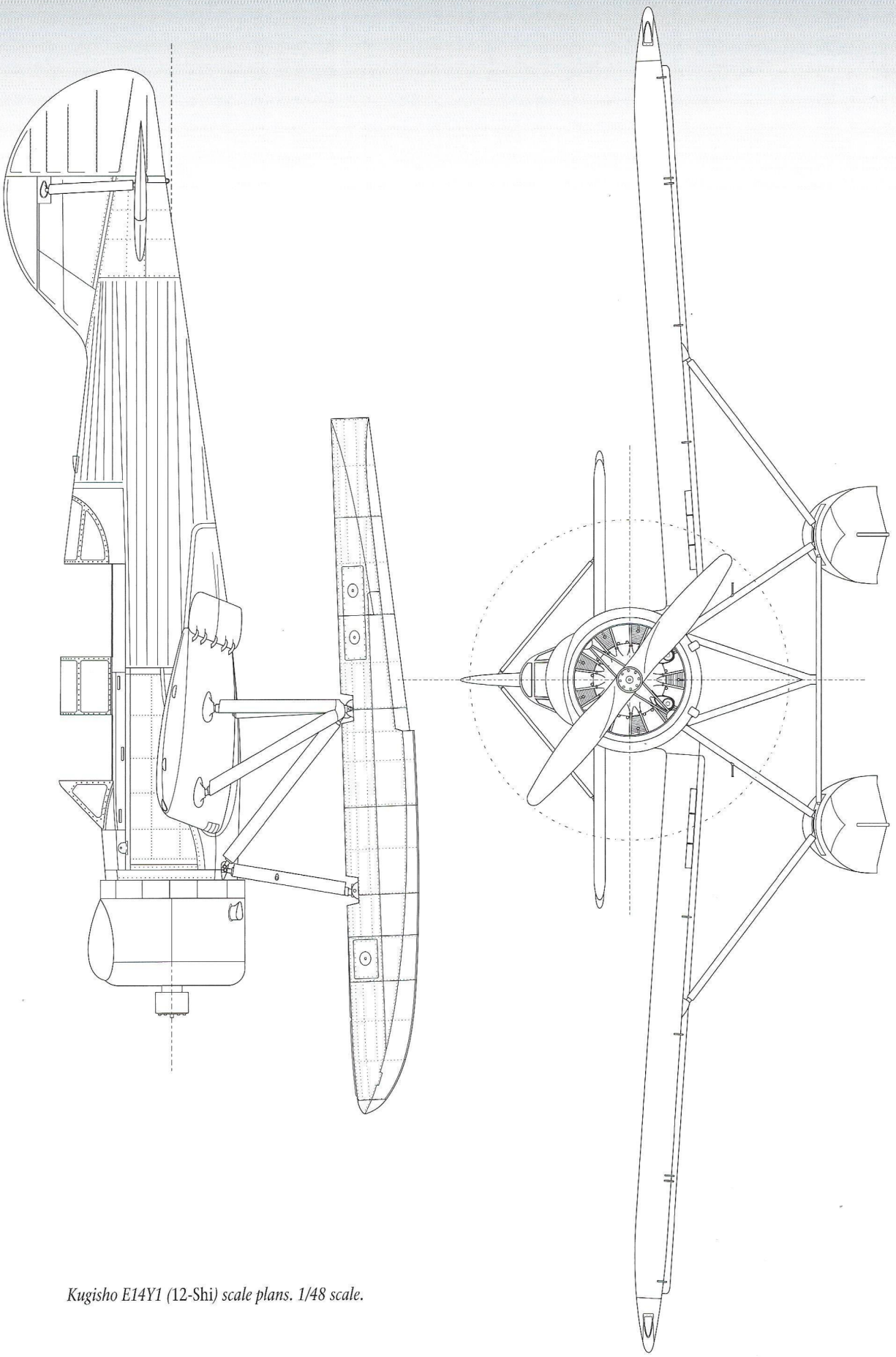
The first prototype of the E14Y1 reconnaissance seaplane during test flight over Tokyo Bay. It was built by the Kugisho arsenal. Sub-Lieutenant Ohkane is in the first cockpit, while the observer's cockpit is occupied by engineer Hajime Kato, the chief designer of the Kugisho arsenal.



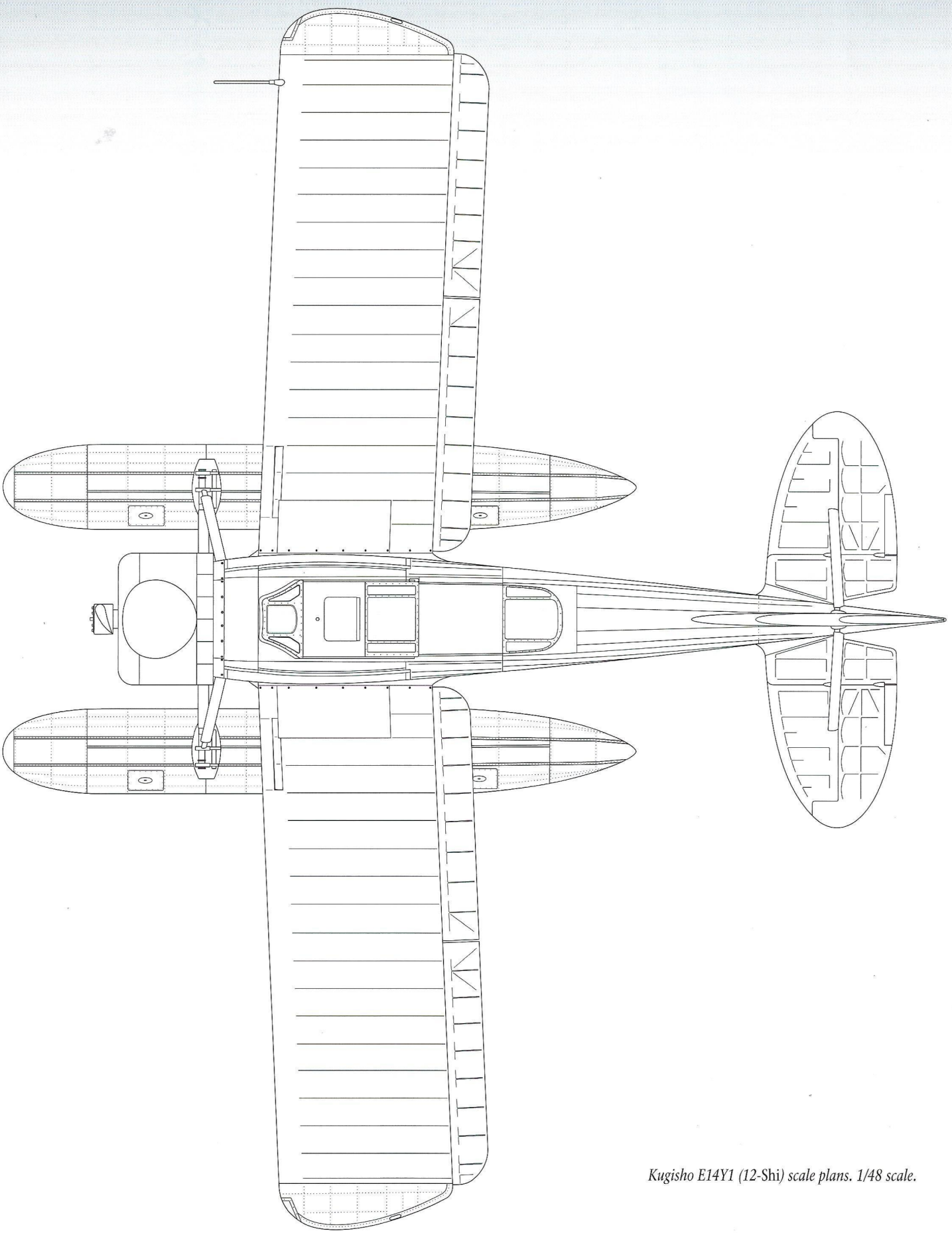
The first prototype of the Kugisho E14Y1 (12-Shi) with early version of the engine cowling. The fuselage was painted silver overall with plain Hinomaru *on its sides and under wings. The wing tips were painted red, and it seems to have red propeller danger stripe and thin red dolly positioning stripes.*

Empty weight of the two first prototypes was 1,130 kg, 180 kg more than the expected 950 kg. Take-off weight was 1,600 kg, while it had been expected to be no more than 1,500 kg, as limited by the resistance of the ship's catapult. For this reason the seaplane's tanks could only be filled with fuel to 200 litres, or half their capacity. This amount of fuel allowed operations within 300 nautical miles, half the required range. Therefore the E14Y1 seaplane could not be used in its intended role. Moreover, it was unstable in flight, showing a tendency to fall off course, and was nose-heavy in straight and level flight.

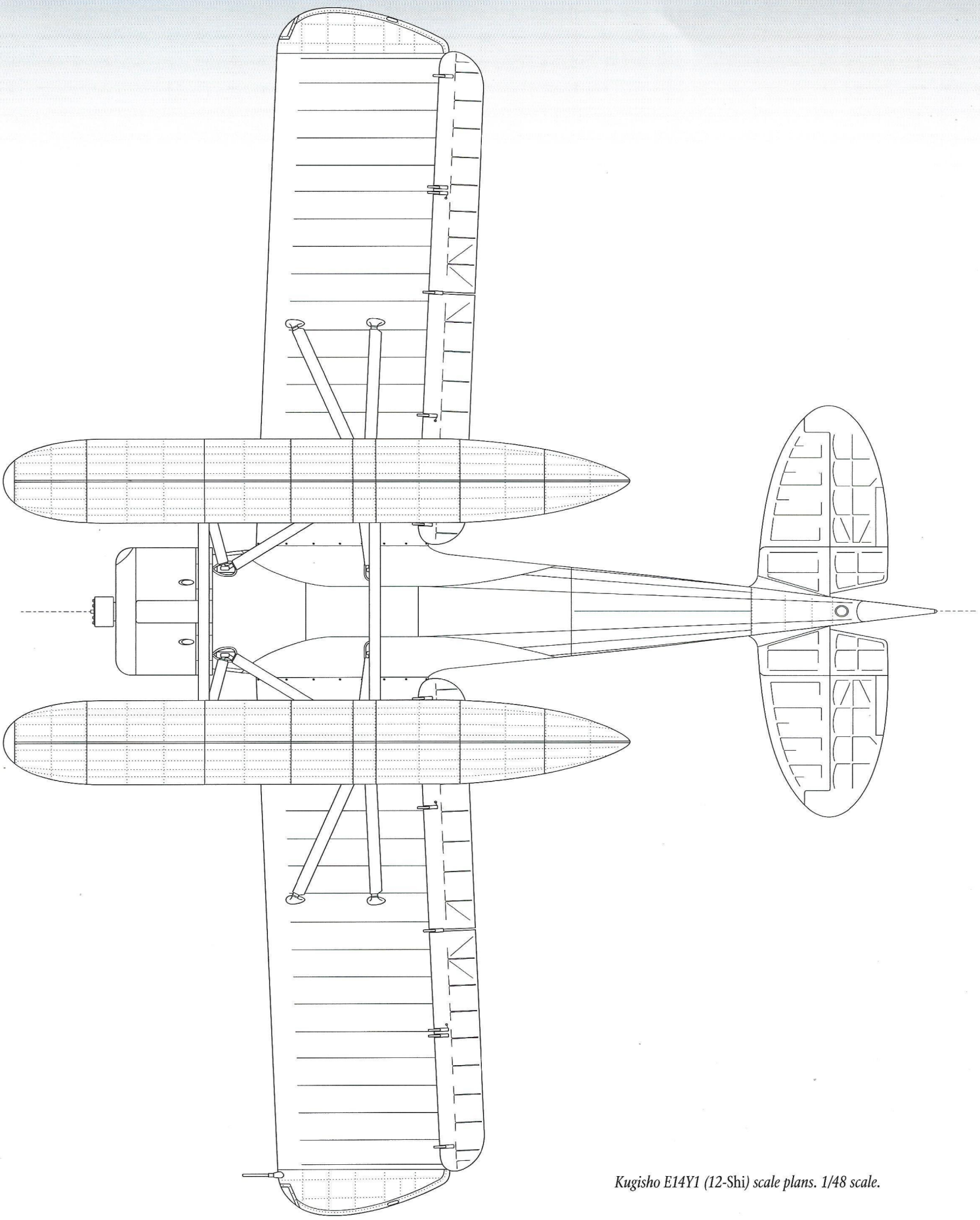
At the same time *Ko* and *Otsu* class submarines were undergoing construction at high priority, and these were going to be equipped with reconnaissance seaplanes, so the *Kaigun Koku Hombu* was forced to use every available means to ensure that the seaplane under development proved useable. Therefore the designers of the E14Y1 seaplane were forced to seek new practical engineering solutions. First of all catapult strength was improved so that it could launch a seaplane with a take-off weight of 1,600 kg. Moreover, the seaplane was slimmed down by 80 kg. Following completion



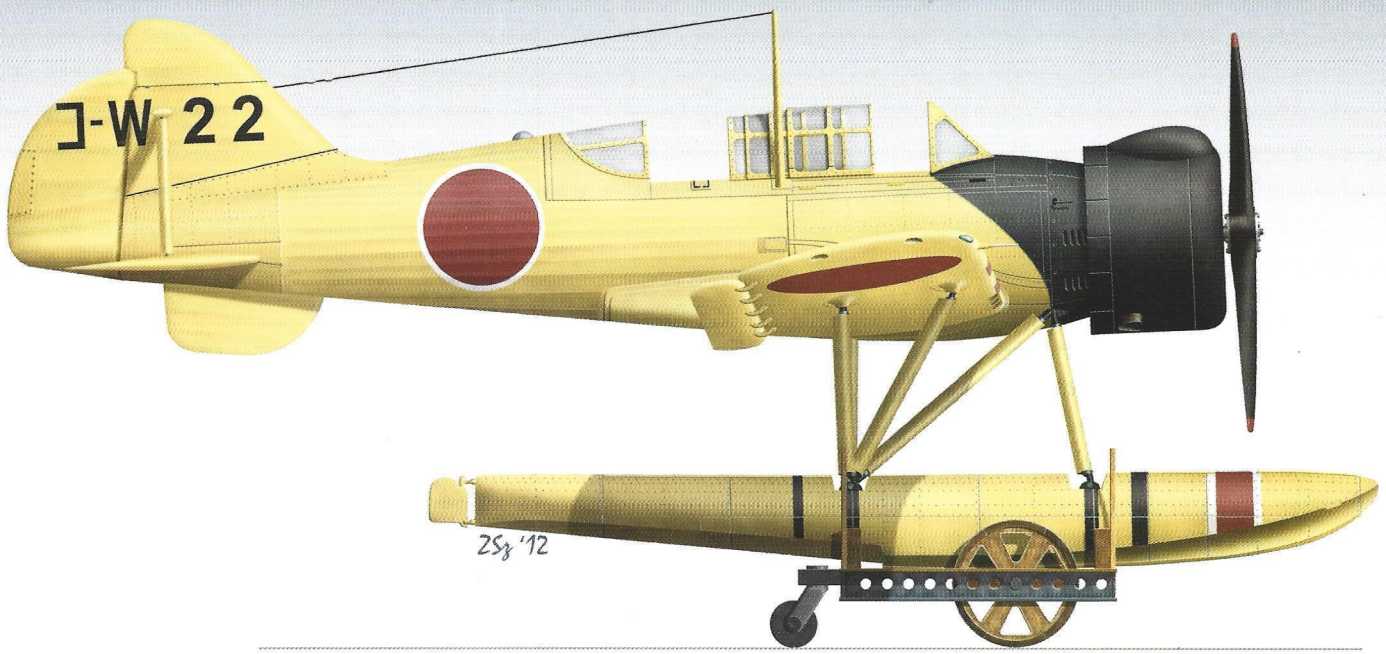
*Kugisho E14Y1 (*12-Shi*) scale plans. 1/48 scale.*



Kugisho E14Y1 (12-Shi) scale plans. 1/48 scale.



*Kugisho E14Y1 (12-*Shi*) scale plans. 1/48 scale.*



Second prototype of the E14Y1 Model 11 with the early type of engine cowling. The code 'Ko-W 22' shows it is Watanabe-made, 2nd (second '2')E14Y1 of the 2nd (first '2') type prototype, tested by Kokugijyutsusho (Air arsenal).

of the first two prototypes, ten more machines were built in the pre-series batch. That was built by Watanabe, as Kugisho arsenal had too much other work. Two more prototypes (the third and fourth) had a reduced empty weight and this solved the question of excessive loading on the catapult. Flight trials revealed another problem, poor stability in straight and level flight. This instability problem was solved by increasing the fin height and area, and the rudder area, and also by reshaping and redesign of the wing root fillet.

According to the specification the E14Y1 seaplane was fitted with defensive armament, a Type 92 7.7 mm (0.303 in.) machine gun fitted on a rotating mount in the observer's cockpit that was subsequently not normally carried on reconnaissance missions. Racks for two 30 kg bombs could be fitted under wings.

Series production

Following introduction of design changes, the E14Y1 seaplane was acceptable. Therefore, on 17th December 1940 the *Kaigun Koku Hombu* approved it for series production. It was initially given the designation 'Type 0 small naval seaplane Model 1', and production was entrusted to Watanabe, which still had free production capacity. According to the agreement with Watanabe, after the production tooling was prepared, the first production E14Y1 seaplane was built in April 1942 under the new military designation of 'Type 0 small naval reconnaissance seaplane Model 11'. All E14Y1 seaplanes, except the first two prototypes, were built by the Watanabe Tekkosho Company, which in May 1943 changed its name to Kyushu *Hikoki*.

The first two prototypes were built by the Kugisho arsenal between March 1938 and March 1942, and next ten pre-production E14Y1s were built by Watanabe Tekkosho; the same factory built the next 126 production aircraft between April 1942 and September 1943. The original order called for 254 seaplanes, including 93 in 1942 and 161 in 1943; the last six were to leave the production line in September 1943. Due to the adverse situation of Japan, and especially the loss of air superiority, the *Kaigun Koku Hombu* cancelled further orders. The monthly production numbers given below are cited by the US Strategic Bombing Survey.

Year	Month	Ordered	Manufactured
1942	April	2	1
	May	3	2
	June	5	5
	July	8	3
	August	10	3
	September	12	4
	October	15	6
	November	18	4
	December	20	8
Total in 1942		93	36
1943	January	25	10
	February	30	9
	March	35	10
	April	25	12
	May	15	11
	June	15	7
	July	10	13
	August	6	12
	September	0	6
Total in 1943		161	90
Total		254	126

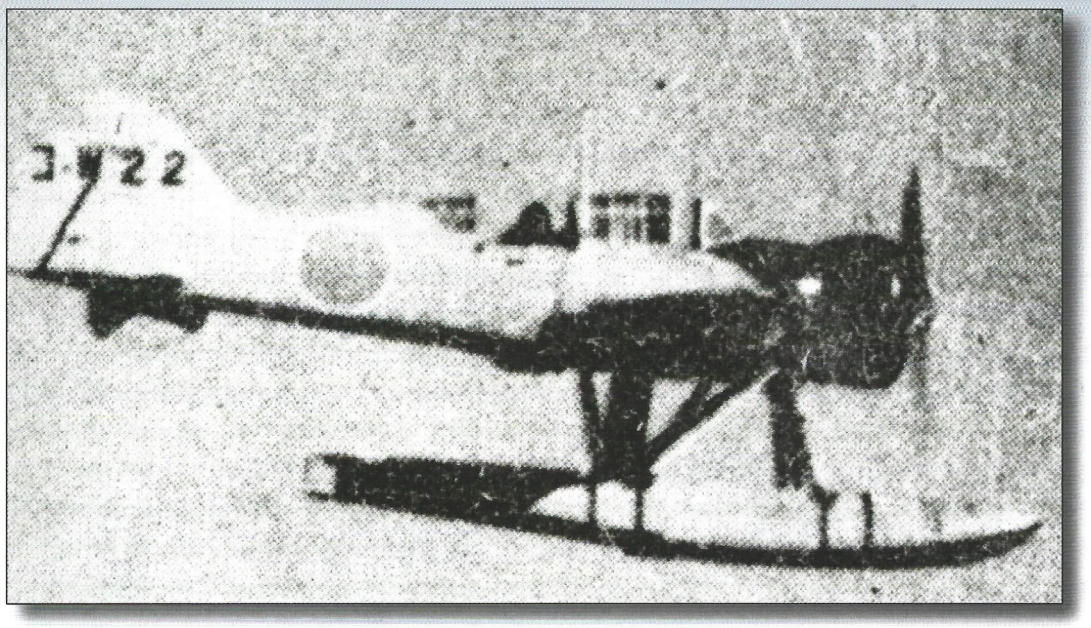
In 1943 a design change was introduced to allow carriage of two 6-Ban (60 kg) bombs. This resulted in maximum weight increase to 1,750 kg. As the wing struts could not be strengthened, on 5 June 1943 a note was added to the operating manual: "*it is advisable to alight on the water with the bombs attached only in windless weather. Catapult takeoff is possible with acceleration of no less than 2.8 G.*".

E14Y1 seaplanes were built from April 1940, but the first production seaplane did not enter service with the Navy until the second half of 1942. Production was halted in early September 1943. By that time 126 production seaplanes had been built, plus two prototypes and ten pre-series batch machines, for a total of 138 E14Y1 seaplanes.

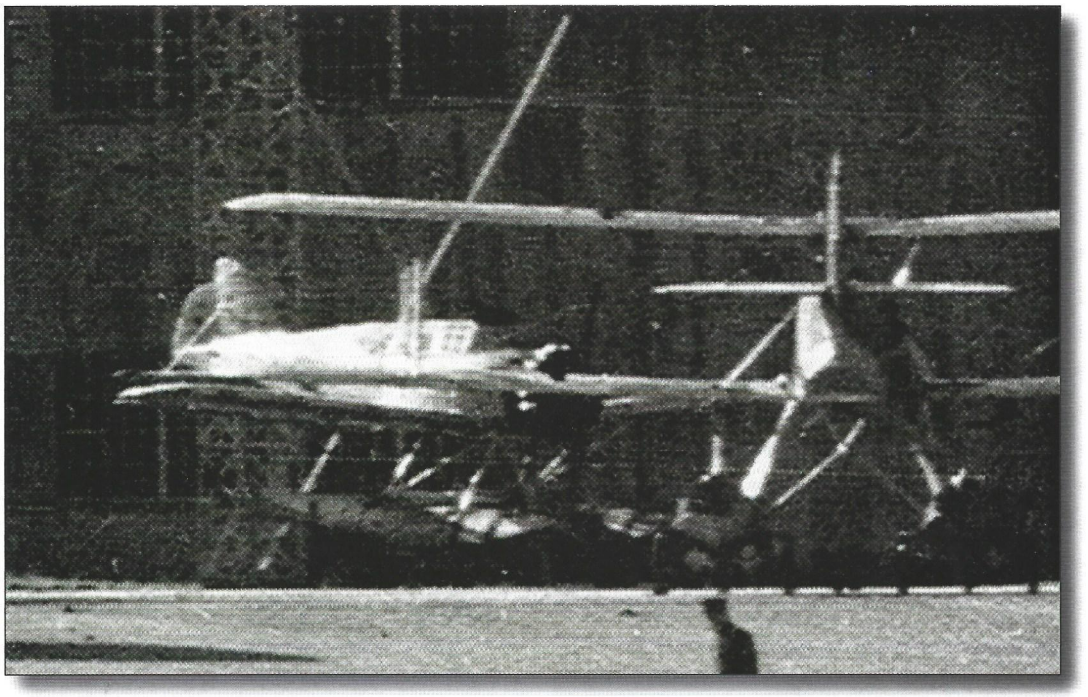
Monthly output of E14Y1 seaplanes built by Kyushu Hikoki company (previous name Watanabe)

Month	No. assembled in 1942	No. assembled in 1943
January	-	10
February	-	9
March	-	10
April	1	12
May	2	11
June	5	7
July	3	13
August	3	12
September	4	6
October	6	-
November	4	-
December	8	-
Year total	36	90
Grand total	126	

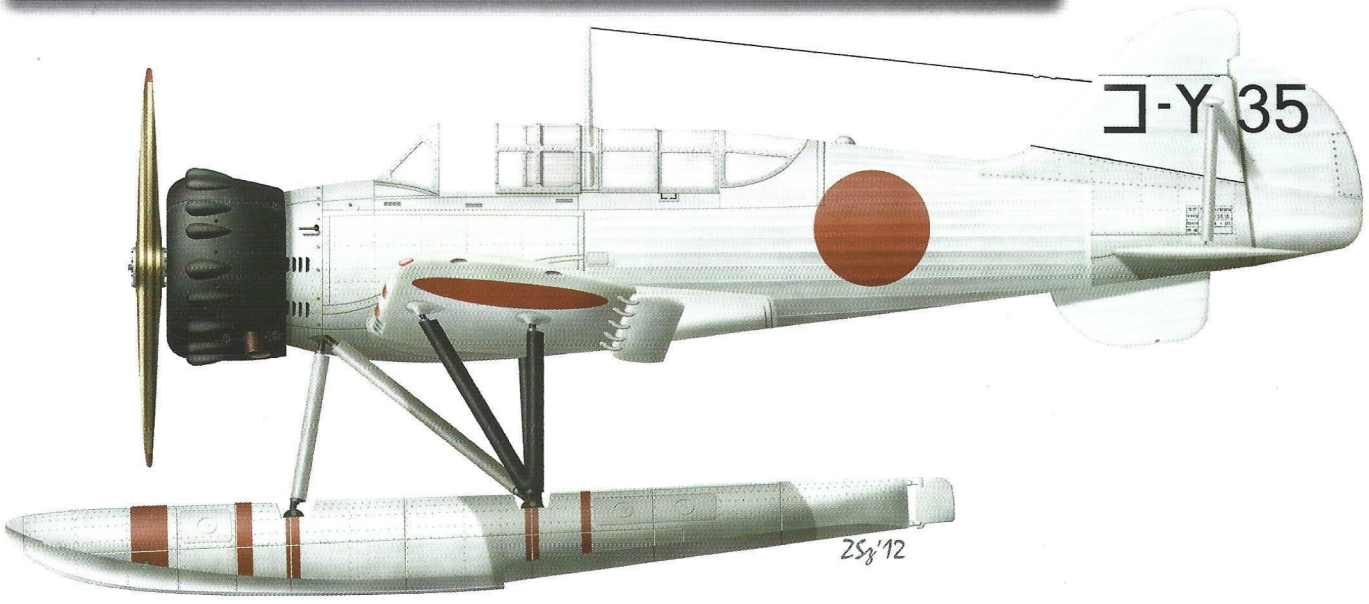
According to a paragraph in the contract for series production of E14Y1s by Watanabe, the Navy requirement for the type was 254 aircraft, but in the scheduled time of 18 months Watanabe was able to complete only half the order.

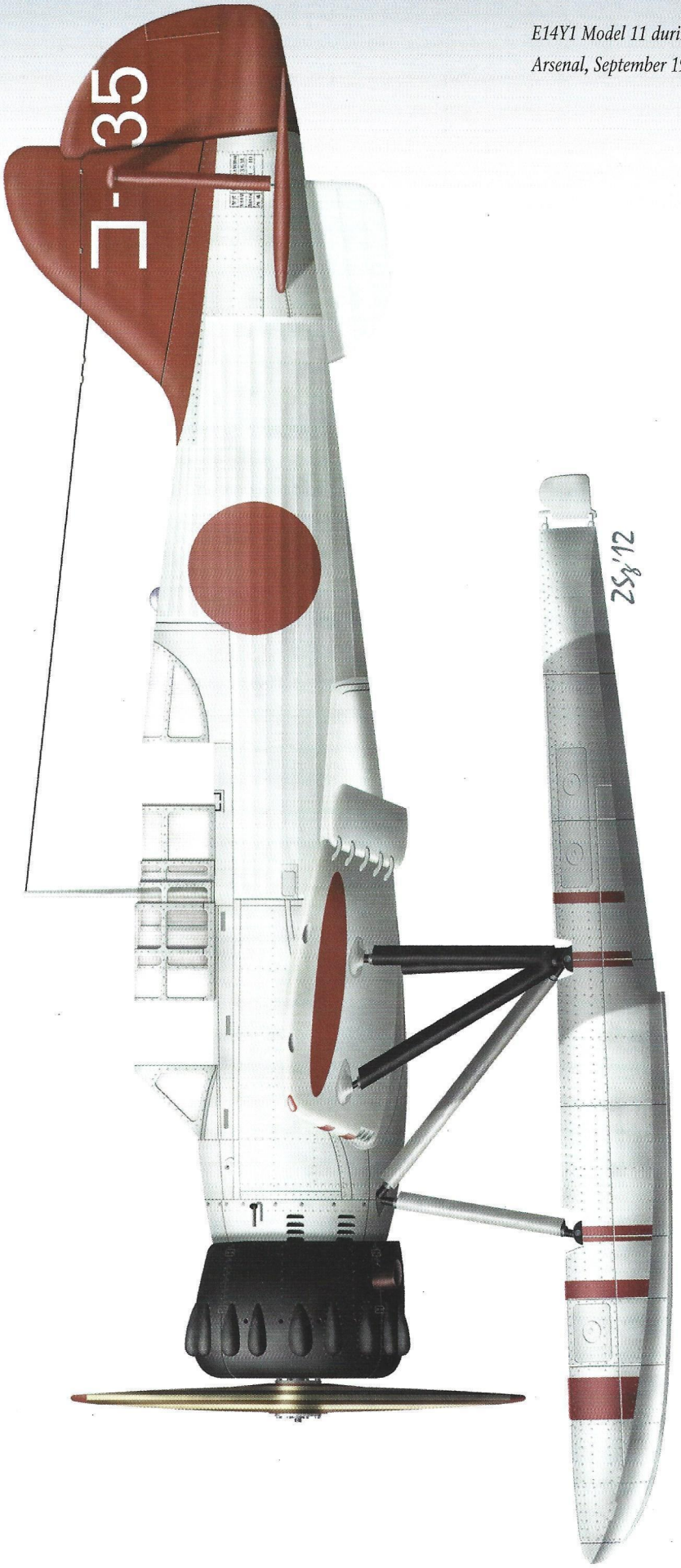


The second pre-production prototype of the 'Type 0 Small naval reconnaissance seaplane Model 11', E14Y1, [KO-W 22] built by Watanabe (Kyushu). It has early type engine cowling painted black. Orange-yellow overall with Hinomaru *outlined in white. Notice red and black stripes on the float.*



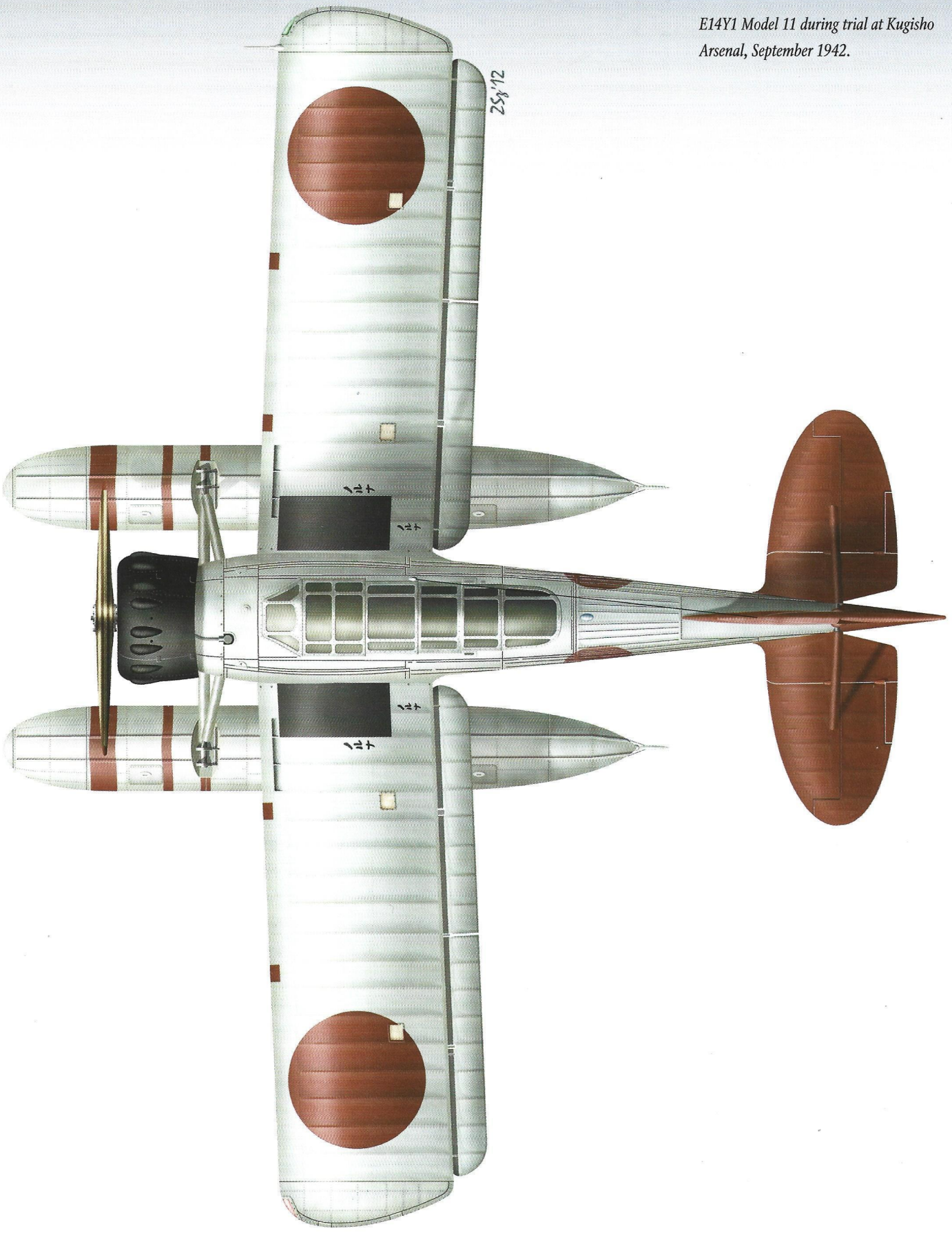
E14Y1 Ko-Y 35: tested by Kokugijyutusho (Kugisho) at Yokosuka Kokutai, No. 5 plane of the 3rd prototype with the revised cowling. It was painted silver overall with plain Hinomaru *Orange-yellow paint for prototypes was discontinued from July 3, 1942.*



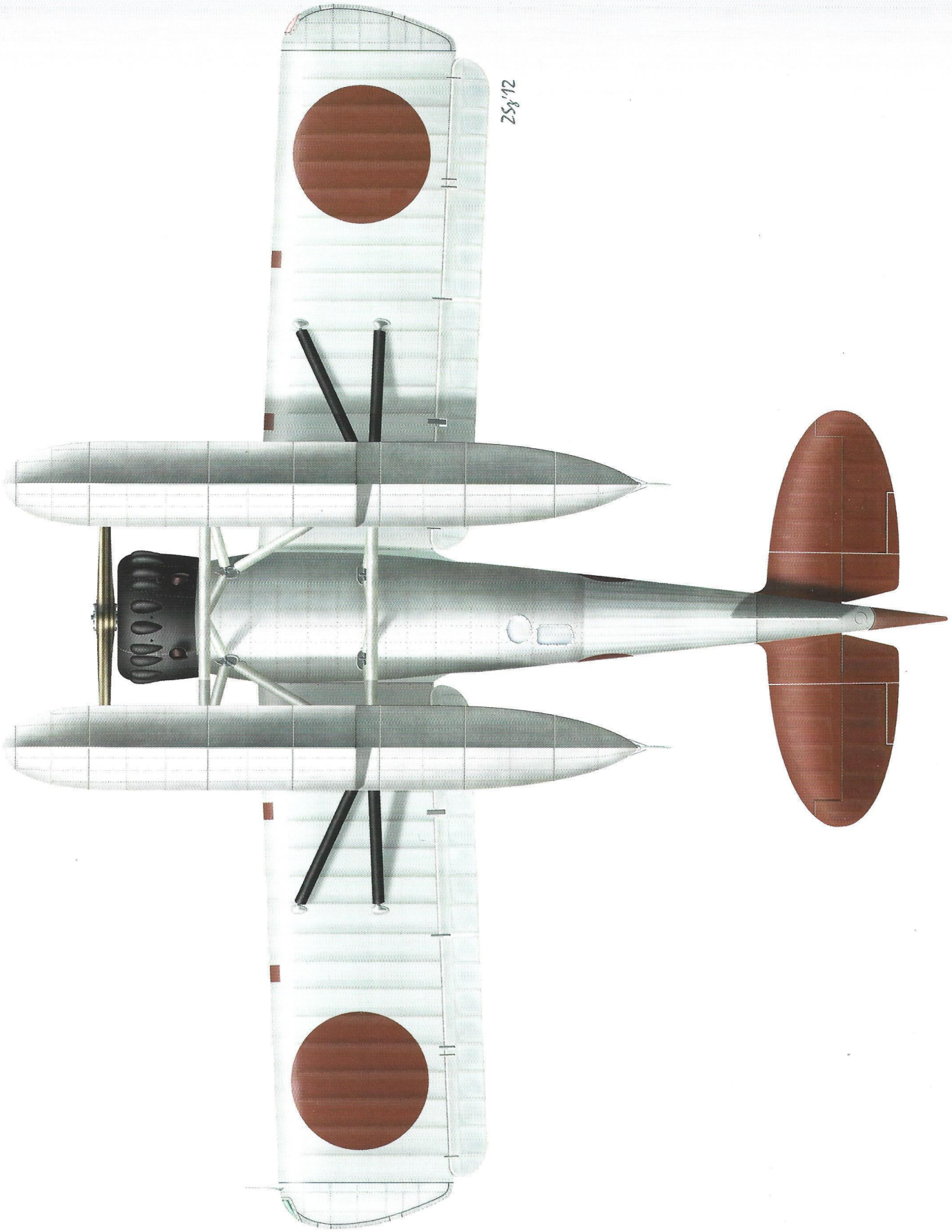


E14Y1 Model 11 during trial at Kugisho Arsenal, September 1942.

E14Y1 Model 11 during trial at Kugisho Arsenal, September 1942.



E14Y1 Model 11 during trial at Kugisho Arsenal, September 1942.



The Watanabe Tekkosho company

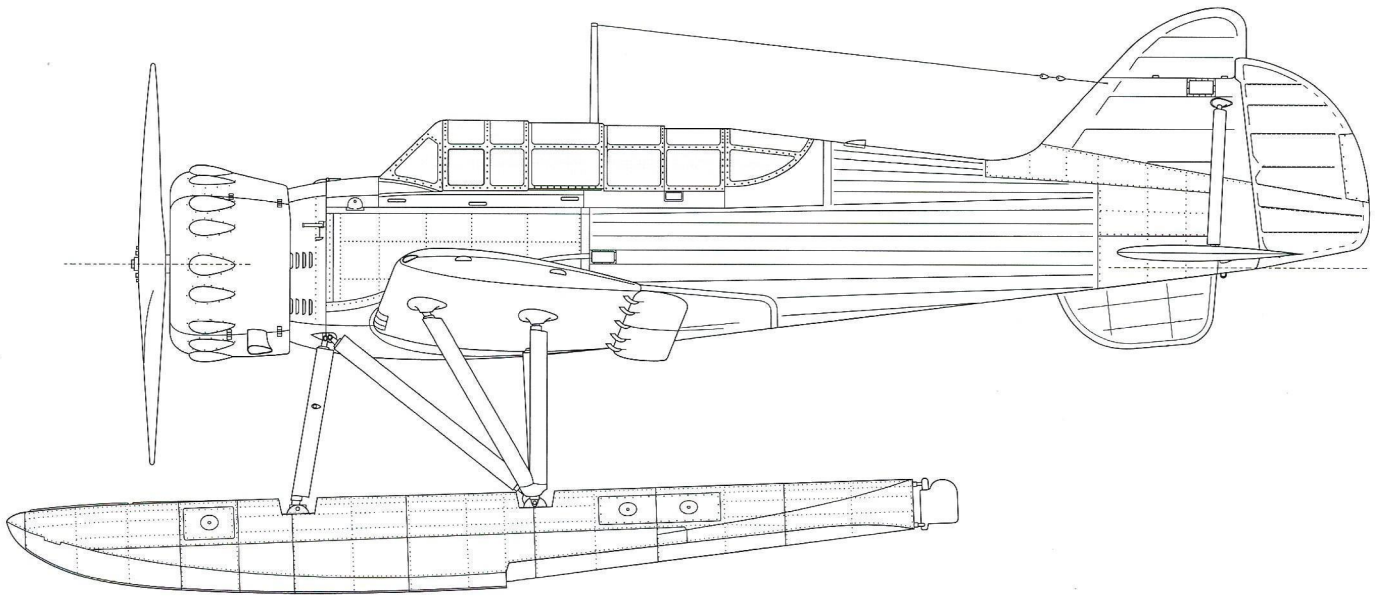
The chronology of the *Watanabe Tekkosho Kabushiki Gaisha* (Watanabe Metal Works) is as follows:

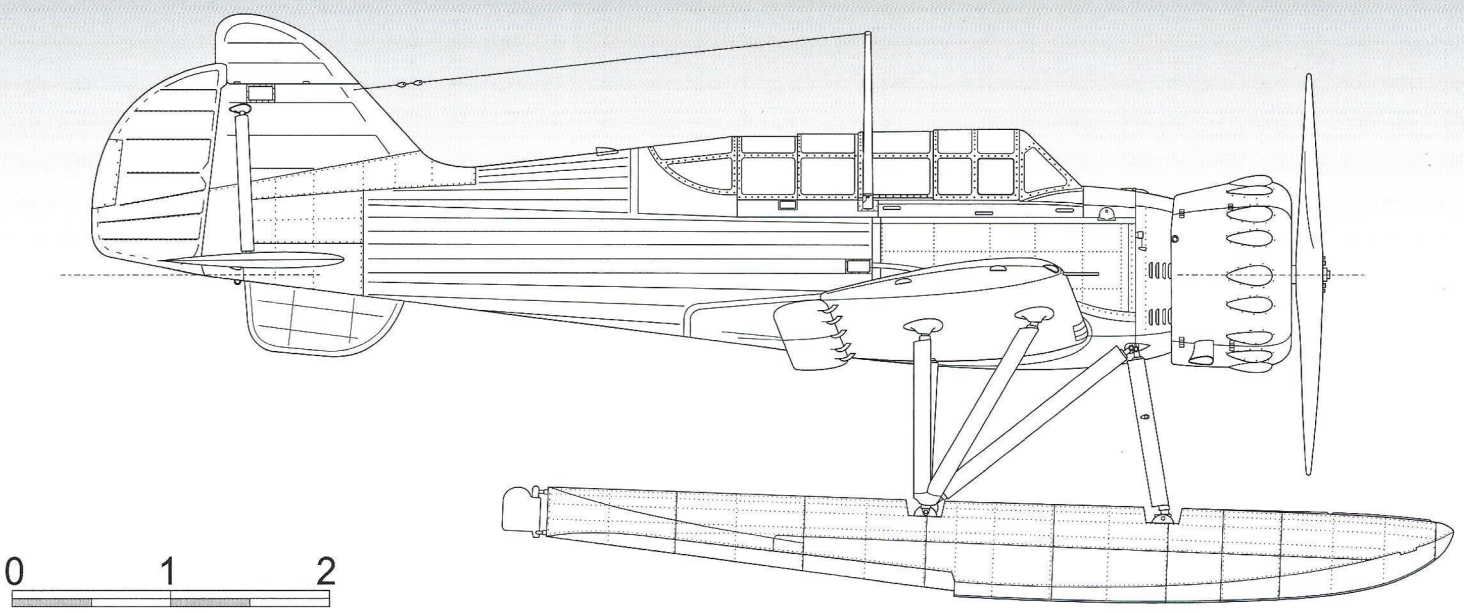
1886 – the *Watanabe Tekkosho* works were established in Fukuoka as the manufacturer of water pumps.
1919 – started production of parts for torpedoes ordered by the IJN.
1921 – the Watanabe works were appointed as the manufacturer of torpedo tubes for the IJN.
1923 – started experimental production of aircraft tyres.
1930 – the works moved to Zasshonokuma, where the aircraft assembly department was founded. On the new production line the first prototype of the basic trainer K2Y1 for the IJN was built, and later series production of this a/c.
1932 – started production of torpedoes.
1934 – developed and manufactured the prototype of the small reconnaissance seaplane E9W1, and later series production of this a/c.
1937 – in Tachiarai the aviation equipment plant for the IJA was founded.
1940 – started licence production of reconnaissance seaplanes Aichi E13A1.
1941 – started production of the training a/c Ki-86 (based on Watanabe's own design K9W1) for the IJA, started production of the bomber crew trainer K11W1 *Shiragiku*.
1943 – in October the aircraft production facility by the name of *Kyushu Hikoki Kabushiki Gaisha* (Kyushu Aircraft Plant) was established, and the parent factory Watanabe Tekkosho was renamed *Kyushu Heiki Kabushiki Gaisha*. The manager of both firms was Fukuo Watanabe.
1941 – the Kyushu Hikoki developed the patrol aircraft Q1W1 *Tokai* and started series production.
1945 – the prototype of the J7W1 *Shinden* fighter, with a pusher configuration, was developed and manufactured.

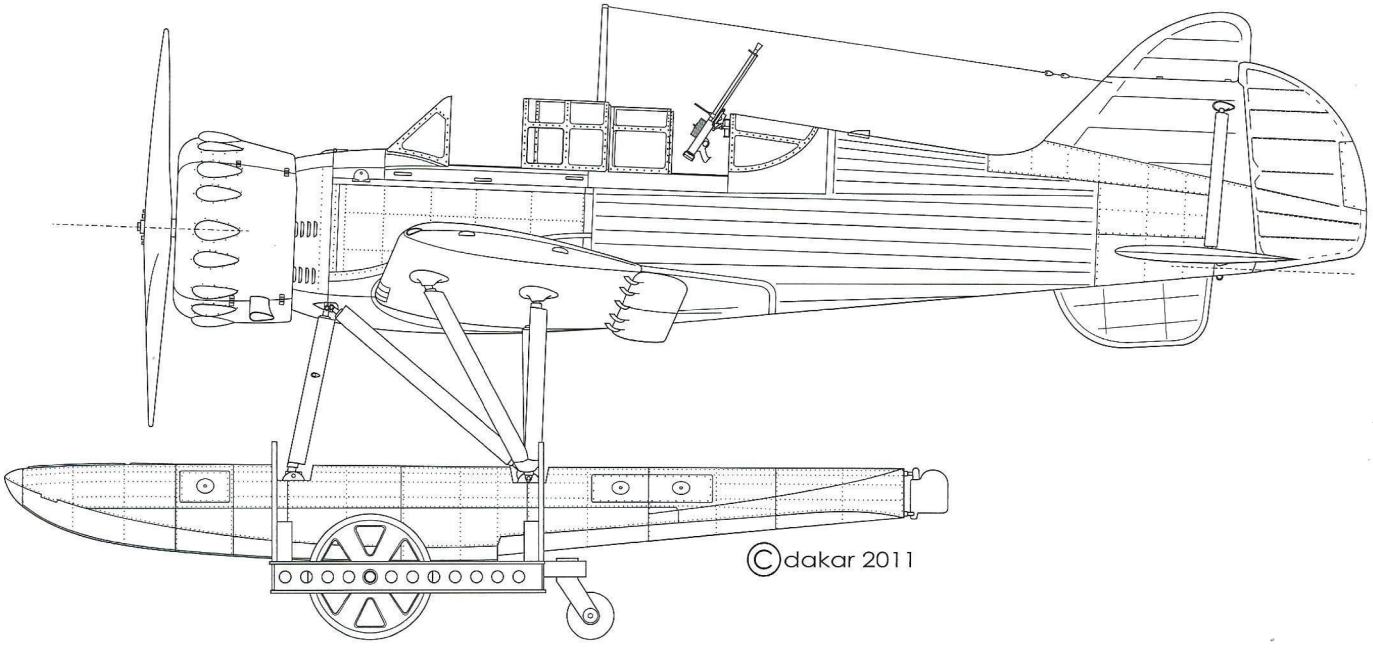
After the war, in 1953, Kyushu Hikoki moved their factory to Kasuga in Fukuoka. They changed the name of the company to Watanabe Jidosha Kogyo (Watanabe Automobile Industry) and started manufacturing automobile parts, later repairing buses. In 1992, they moved the factory to Kiyama in Saga. The company ceased operating in 2001.

In 1949, Watanabe Tekkosho was founded under the Law of Corporate Reconstruction Preparation. In 1985, the corporate name was changed to Watanabe *Tekko Kabushikigaisha* (Watanabe Engineering Corporation).

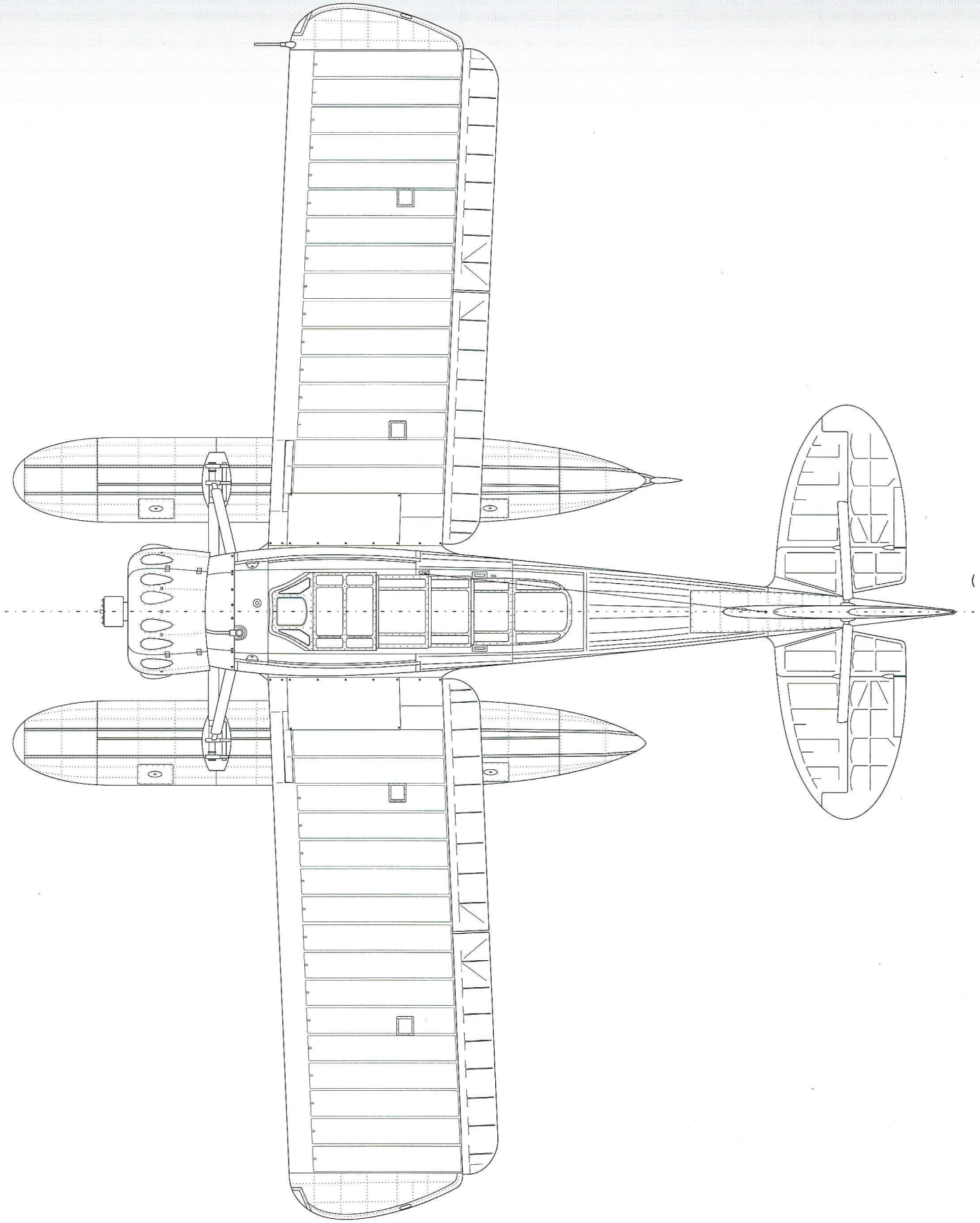
Kugisho E14Y1 Model 11 side view. 1/48 scale.





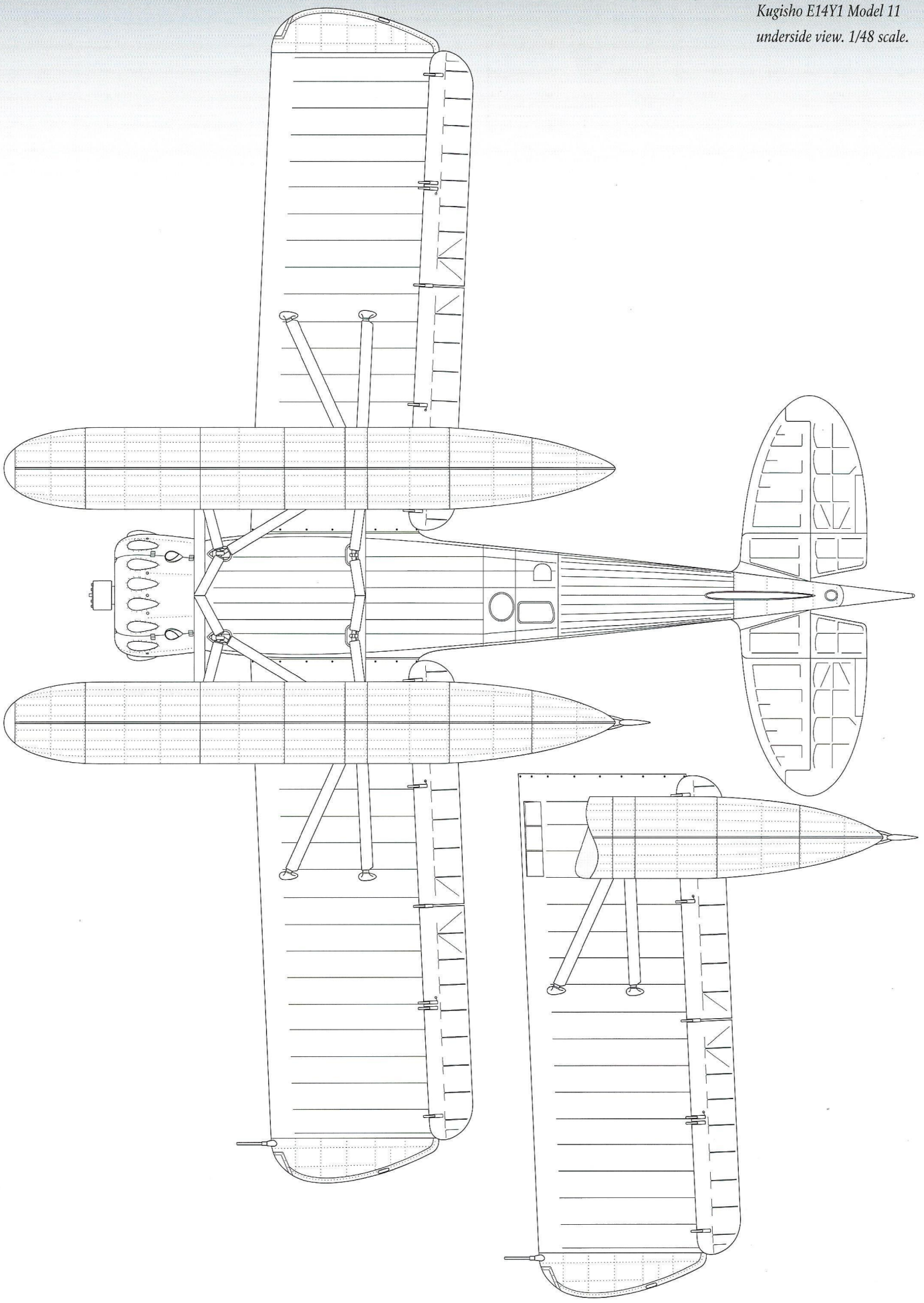


Kugisho E14Y1 Model 11 side views. 1/48 scale.

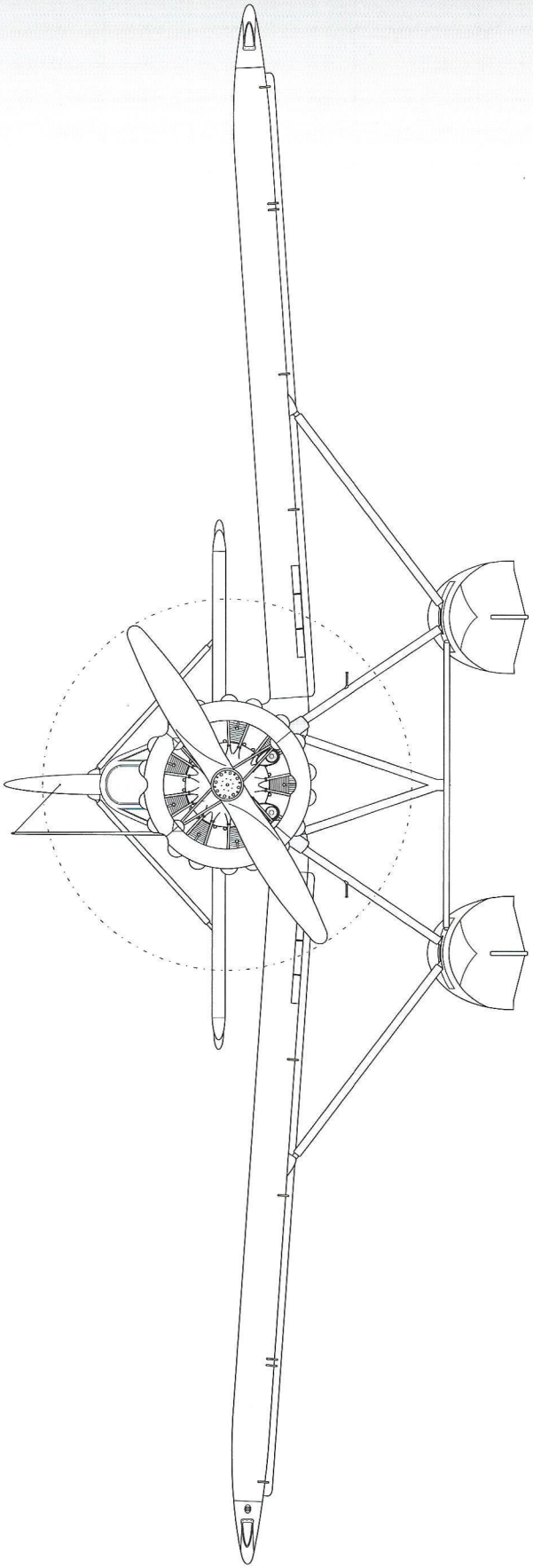


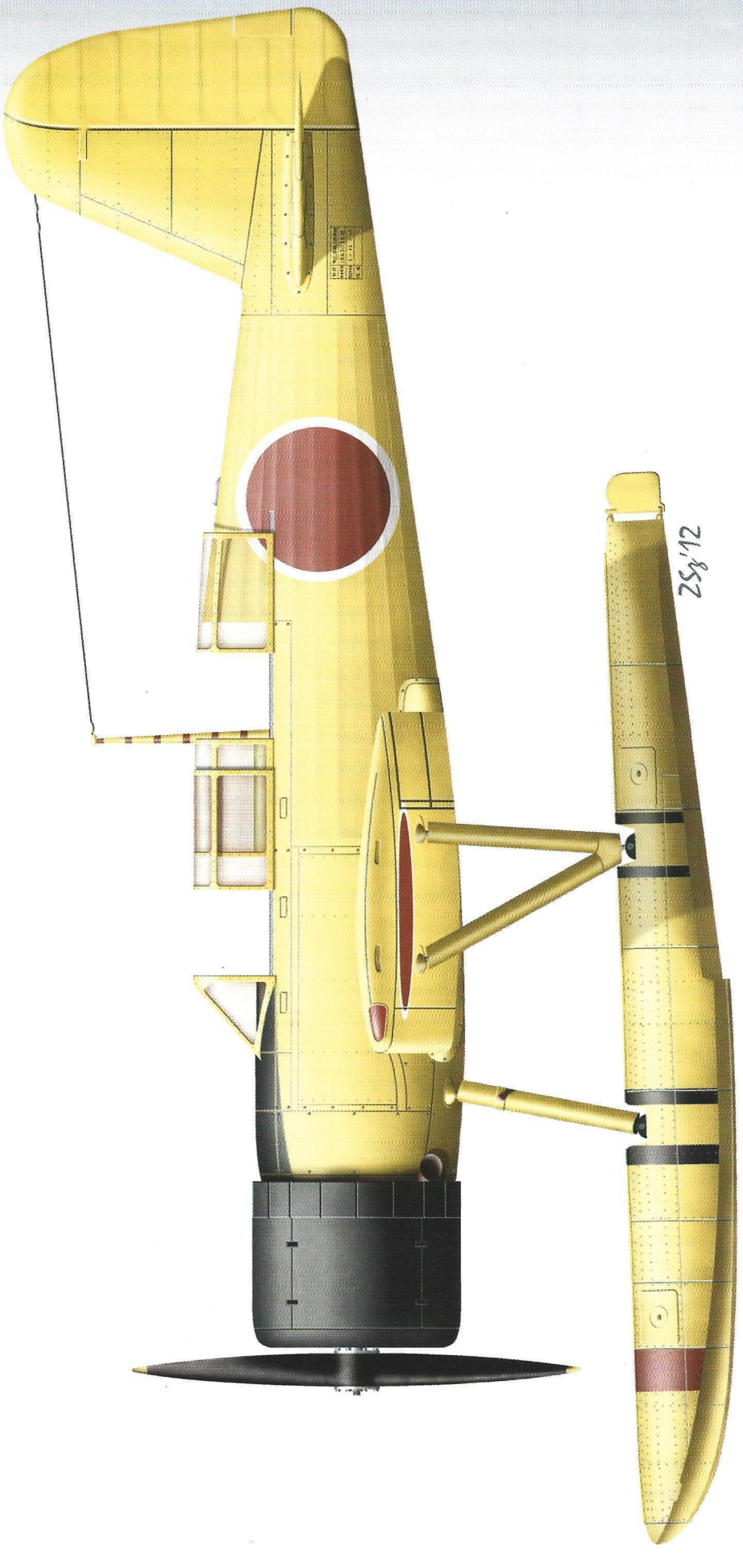
Kugisho E14Y1 Model 11 top view. 1/48 scale.

Kugisho E14Y1 Model 11 underside view. 1/48 scale.



Kugisho E14Y1 Model 11
front view. 1/48 scale.





Project of the Kugisho E14Y2 Model 12.

E14Y2 development version

Performance of the E14Y1 seaplanes was significantly different from previous designs and met the needs of the submarines completely. This was also a success of Japanese engineers, who developed the aircraft as the basis for the Japanese 'submarine air force', unmatched by any other country during WW2, even though Japan merely continued the experience that had been started but abandoned by others.

Despite this success, in 1942 Watanabe designers prepared a developed version and built a prototype, which received the designation of 'Type 0 Small naval reconnaissance seaplane Model 12' (E14Y2). This may have been in response to the *16-Shi* specification that Watanabe received in December 1941 or at Watanabe's own initiative.

The E14Y2 seaplane featured a more streamlined fuselage, altered tail surface planform, and several other external details. It was powered by the Hitachi *Tempu* 21 engine rated at 510 hp for take-off.

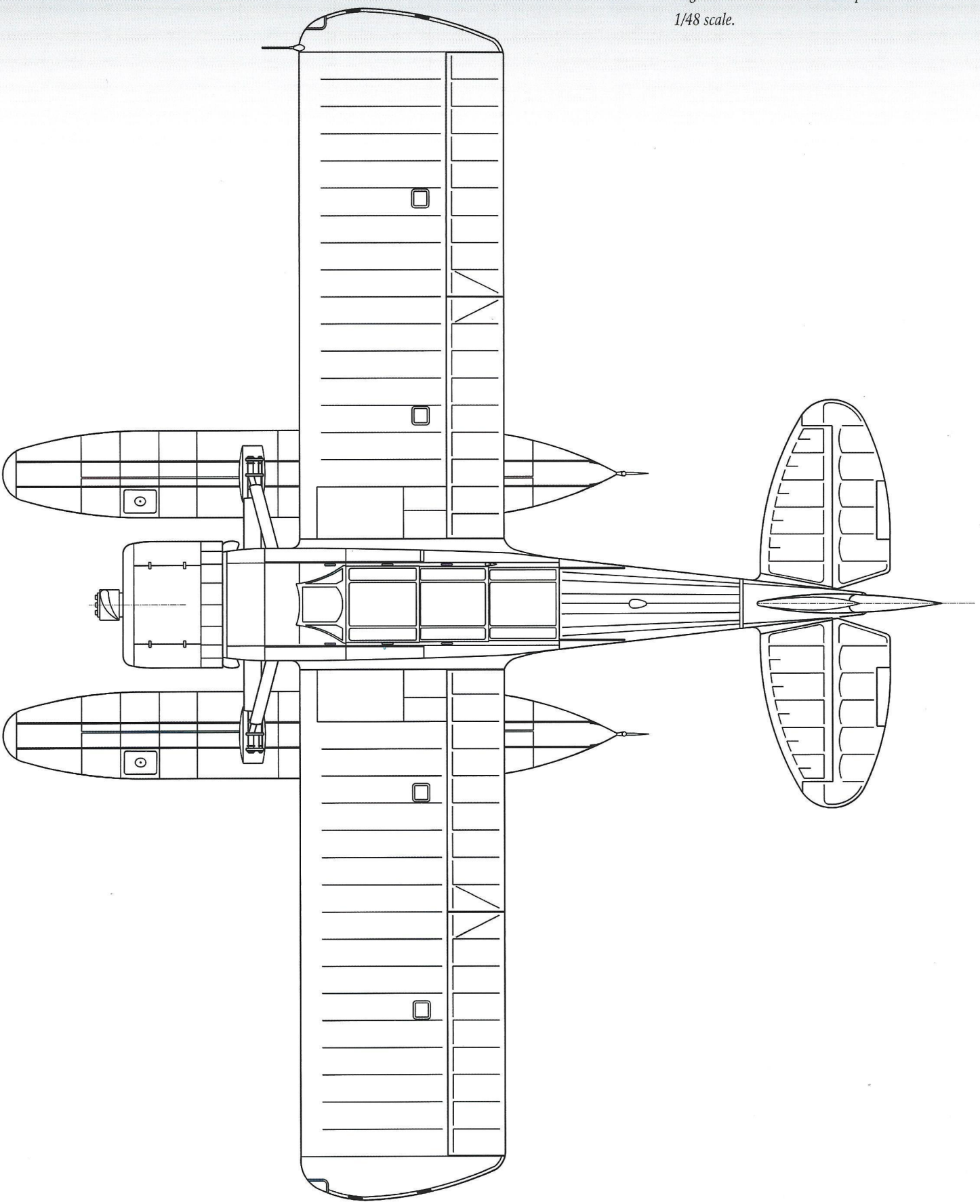
Not much is known about this version. However, there is information that in 1942 it was frequently seen in vicinity of Najima naval base near Fukuoka. The number of E14Y2 seaplanes built is not known, their production apparently started by Watanabe.

E14Y successors

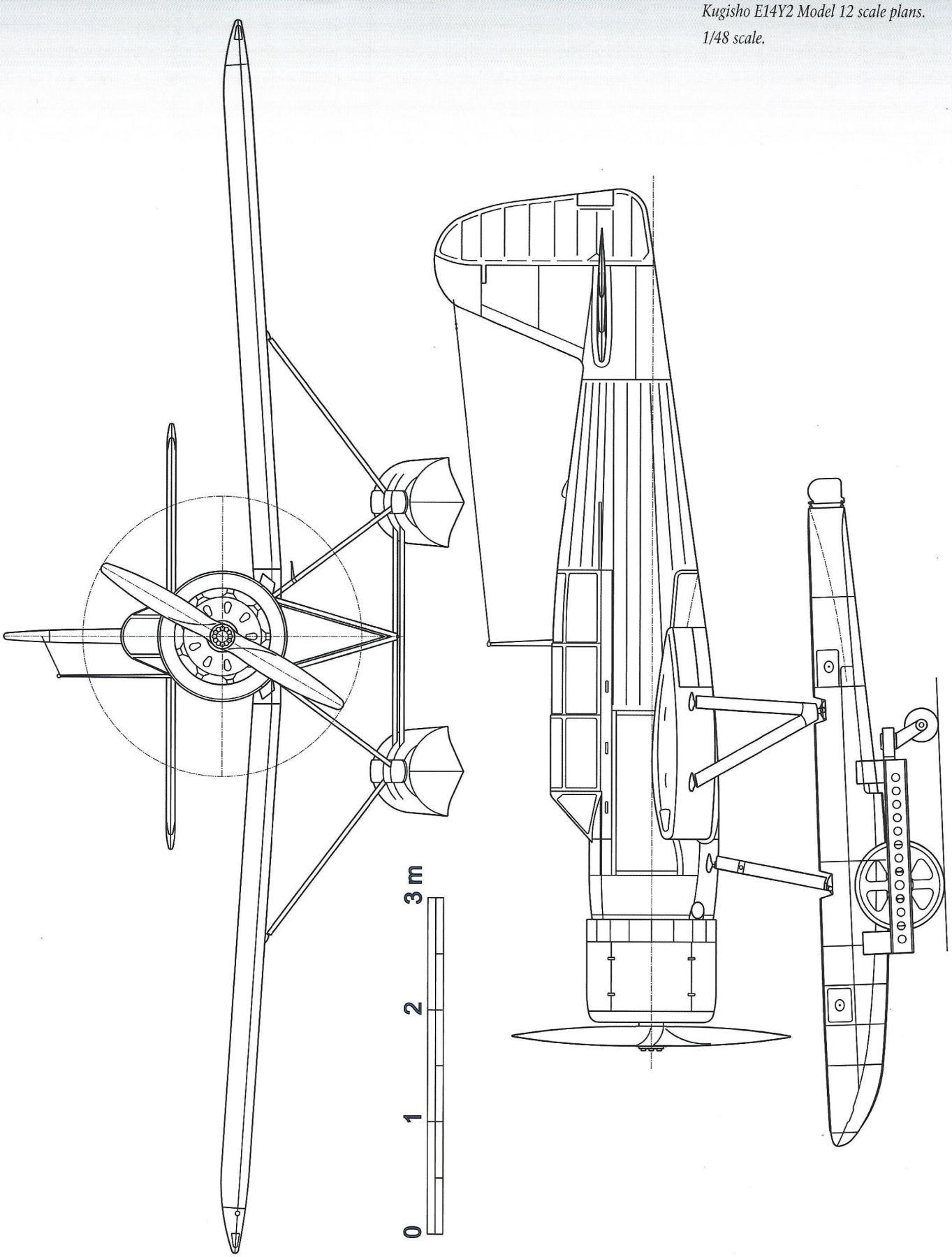
According to the new development programme, another submarine-based reconnaissance seaplane was to be developed. Following complete flight trials of the E14Y1, in December 1941 the *Kaigun Koku Hombu* prepared the *16-Shi* specification and placed an order with Watanabe, among others, to design and build a prototype according to the specification, as previous operational trials showed that the E14Y1 seaplanes were too slow, among other limitations. Therefore, the new generation submarine-based reconnaissance seaplane should have a higher cruising speed and higher operational ceiling. To meet the requirement it was suggested to use the Hitachi *Tempu* 21 radial as power plant. The development of the new seaplane was closely connected with the large submarine projects. It was assumed that, without significant changes in the design of the seaplane for these submarines, no new seaplane would be accepted.

The next specification, *18-Shi*, to design and build a similar experimental seaplane, was received by Kyushu *Hikoki* in 1943. However, progress of the *16-Shi* and *18-Shi* specifications for the successor to the E14Y stalled, due to lack of synchronisation with the development programme of large submarines. At the end of 1943 work commenced on another specification, *19-Shi*, for a similar experimental submarine-based reconnaissance seaplane, that would be approved in 1944. Work on these was not started either, this time because of a change in tactics and the changed strategic situation of Japan. At the time Aichi continued intensive work on the M6A1 *Seiran* seaplane, which later entered service with *I-400* class submarines.

Kugisho E14Y2 Model 12 scale plans.
1/48 scale.



Kugisho E14Y2 Model 12 scale plans.
1/48 scale.



Operations

The hangar for E14Y1

I-Go Otsu type submarines had a hangar for one E14Y1 in front of the bridge. It contained a E14Y1 disassembled, and sealed up with a tight cover. The details of hangar door mechanism are not known because there is known because there is no surviving close-up photo or drawing. This may be because such details were considered top-secret. The tight cover was manually opened and closed. The hinge was to port, with the latch mechanism on the starboard side. An accident was reported that a crew member released the cover lock and it suddenly opened and killed him. It was probably because of the high pressure made by leakage of oil in the hangar.

E14Y1 seaplane take-off and recovery procedures.

Following intensive training of the seaplane air crew and of the engineering crew preparations for take-off of the E14Y1 seaplane from a submarine using the catapult should not exceed 30 minutes according to the specification. The catapult take-off procedure under command of a control officer was as follows:

1. Open the deck hangar with the folded seaplane inside. Pull out the fuselage of the seaplane attached with belts to the transport trolley.
2. Fit the port and starboard wings to the fuselage. At the same time fit the propeller and unfold the tailplane to take-off position.
3. Check functioning of the machine gun and radio. These actions are performed by the aircraft crew.
4. Preparation of the catapult by the engineering crew.
5. Pull out the floats and float struts and attach them to the fuselage and wings.
6. Move the seaplane onto the catapult and start the engine. While the engineering crew checks the engine, the crew of the seaplane (pilot and observer) report to the captain at his command post, for their flight orders.

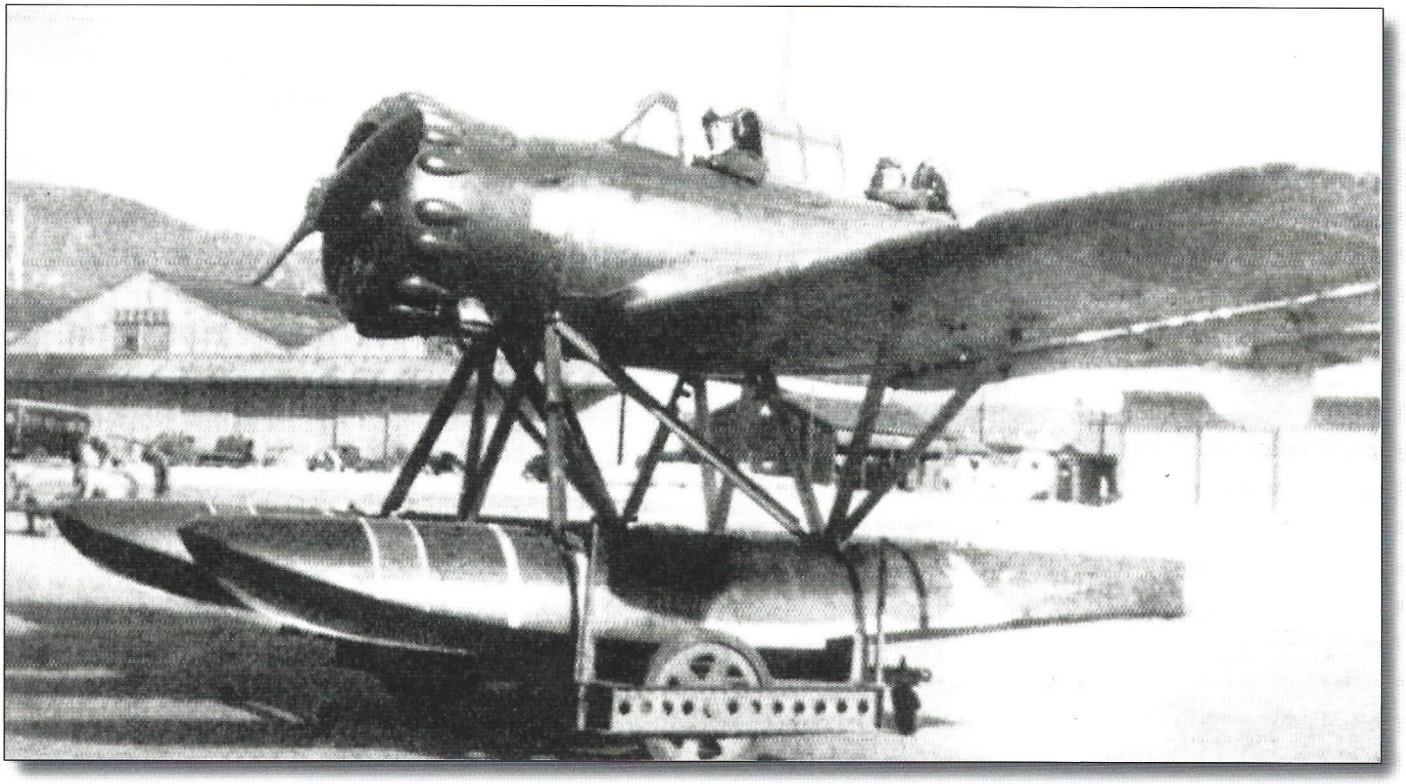
Return of an E14Y1 seaplane to submarine I-37 *from a reconnaissance mission in the spring of 1944 over the Indian Ocean. A few minutes later the seaplane will be hoisted aboard by the crane, and the engineering crew will quickly dismantle it and place in the watertight deck hangar. Notice the hangar door is opened to port, with its locking latch visible.*

7. The engine test should last about five minutes. Set the submarine into the wind and proceed at a speed of 16 knots. The pilot and observer enter the seaplane. The pilot should re-check the engine operation.
8. The pilot reports readiness to take-off to the control officer.
9. Preparations for take-off can only be completed when the control officer makes a circle with a white lamp.
10. When the control officer makes a circle with a red lamp, then the pilot increases the engine revs to maximum power.
11. When the officer makes two or three circles with a red lamp above his head, the catapult is fired and the seaplane takes off.
12. The above procedure should not take more than 25 minutes.

Before the seaplane returns to the submarine, its approach direction, altitude and the method of manoeuvring for identification are agreed.

Return to the submarine and recovery:

- The seaplane should come in to land near the submarine in a shallow descent.
- While reducing the rate of descent the pilot should tell the observer "*we touch down now*".
- The seaplane should alight near the side of the submarine.
- The observer should take out the hoisting cables from their container.
- The seaplane should approach within range of the deck crane and the pilot should switch off the engine.
- The observer should attach the hoisting cables to the crane hook.
- At the whistle signal from the control officer the seaplane should be lifted using the deck crane.
- The seaplane should be lowered onto the transport trolley. Engineering crew should remove the floats and wings from the fuselage.
- The floats, wings and propeller should be placed in the hangar.
- The tailplane should be folded upward. The fuselage should be tightened to the transport trolley with belts and pulled inside the hangar.



E14Y1 Model 11 seaplane on a transport dolly at Kure naval air base. The forward two dolly position stripes are white, but the rear two stripes are black.

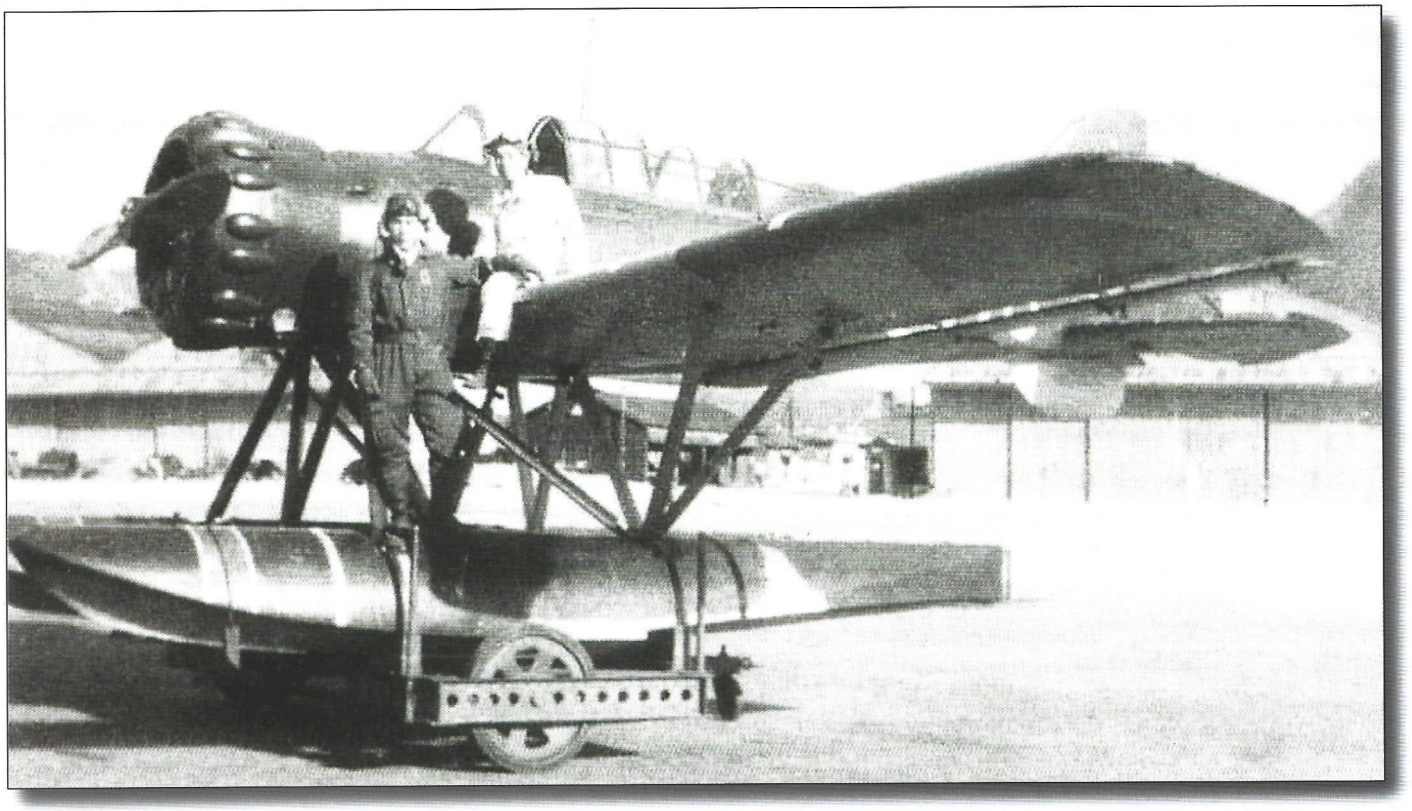
- Preparations for diving should continue at the command post. Hangar hatch should be locked tightly. Engineering crew and the air crew of the seaplane should enter the submarine through the hatch on the conning tower.
- The submarine should submerge to 60 metres.

Strategy of operations

Before Japan achieved its first success operating submarines with seaplanes on board, the Imperial Japanese Navy HQ included them as an important part of its war plans from the early 1930s. It was obvious that Japan, an island country with almost no natural raw material resources, was totally dependent on shipping, hence protection of sea transport was essential; especially if the vast areas of the Pacific and neighbouring seas would be the theatre of operations in a future war. As the southward attack, supported by Emperor Hirohito, was eventually decided, Japan's main opponent would be the USA. Thus the war would consist mainly of amphibious operations, in which an important part would be played by a fleet of submarines, including those with reconnaissance seaplanes on board.

Military plans called for a sudden invasion of the Philippines, Borneo, and the rest of the Netherlands' East Indies, which would naturally lead to an American attempt to recapture the occupied territories. Enemy naval forces would have to react, and also to attack the mainland of Japan. Before the two opposing fleets could engage, the Japanese intended to use the possibility of 'luring' the enemy, because first, the Japanese fleet would be operating near its own bases, and second the approaching fleet would be seriously weakened by effective attacks by Japanese submarines. That was the main role of the latter weapon, which should therefore be strong both in quality and quantity. This explains the firm opposition of the Japanese delegation at the 1930 naval conference in London to the ban on submarine operations in war, as well as Japanese efforts to obtain parity with the USA in this weapon.

However, the plans of Japanese military leaders were based on faulty assumptions, both operationally and technologically. They did not change significantly even after they were modified by Admiral Isoroku Yamamoto, when he planned the surprise air attack against the US Navy base at Pearl Harbor, with submarine co-operation. Experience from WW1 proved that submarines were particularly effective in destroying enemy communication lines. The Japanese

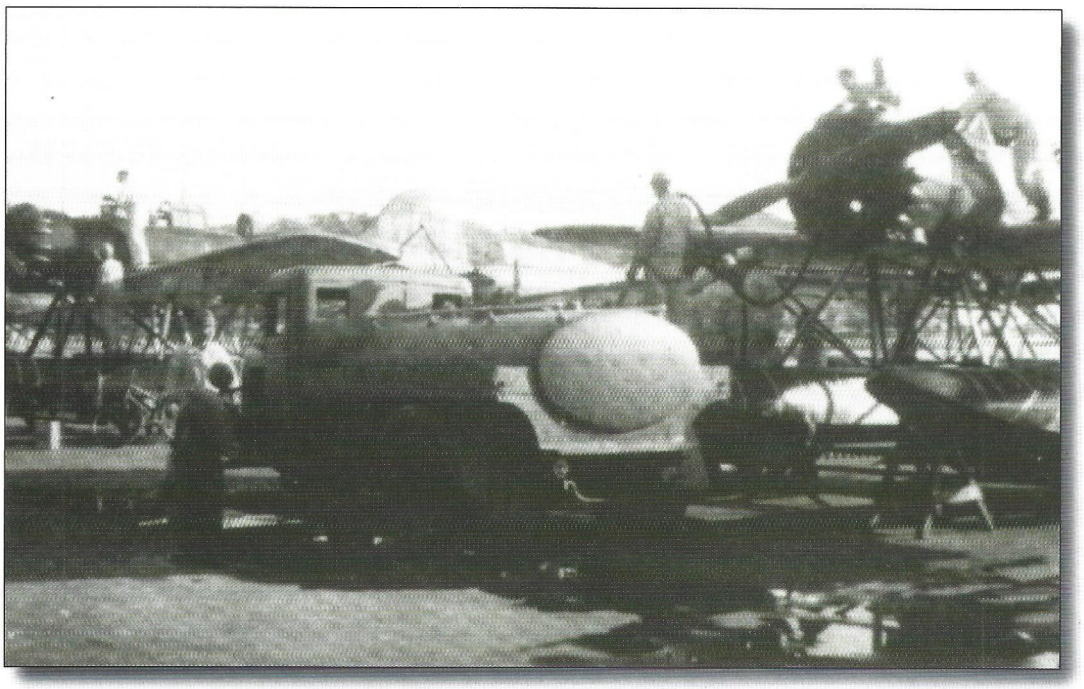


The E14Y1 Model 11 seaplane on a transport dolly.

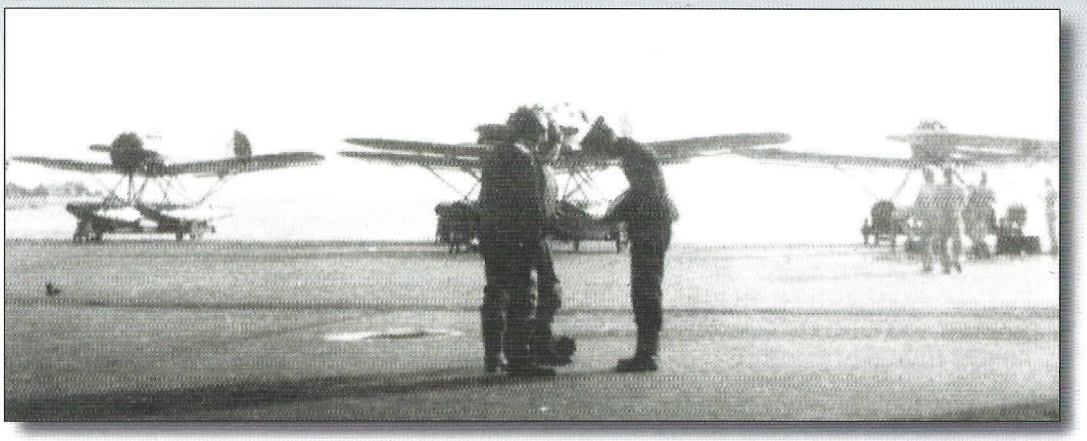
concept, on the other hand, saw submarines grouped in tactical forces and co-operating with surface vessels or performing long range reconnaissance actions. The submarines failed at Pearl Harbor, but their commanders and crews, who counted among the best trained, can hardly be blamed. They were simply used incorrectly.

The Japanese submarine fleet, according to its high command, was well prepared, both in terms of quality, quantity and technology, for operations against enemy communication lines as well as for defence of its own, and also for co-operation with surface vessels and performing long range reconnaissance. But at the moment of the outbreak of war in the Pacific, the Japanese submarine fleet was weak. If the number of 64 submarines is certain, this was too little for the vast area of the Pacific and Indian Oceans, and even just for the waters surrounding Japan. Also the quality raised some doubts. The core of the Japanese fleet consisted of blue-water vessels, true 'submarine cruisers' (*Jun Sen*) and large submarines (*Kaidai*), assisted by medium submarines that could be used for defence of home waters. They were few and rather obsolete vessels. The attack on Pearl Harbor involved 64 submarines, including 41 large ocean-going ones, two medium, and 21 obsolete vessels of little combat value. Therefore, in every way the quality and quantity was not satisfactory.

Most of the Japanese submarines were large ships, with large surface and submerged displacement, long range and high speed. Their large size and technological shortcomings resulted in limited manoeuvrability and long diving times, and the high and ever growing effectiveness of the US anti-submarine weapons would prove lethal for them. Japanese submarines received unfavourable notes from both foreign and domestic experts. The German naval attaché in Tokyo, Vice-Admiral Paul Wenneker, declared that the Japanese had poor submarines. First of all, they were too large for manoeuvring when under attack. This made them an easy prey for the enemy. Moreover, their hydroacoustic and radar equipment was outdated, compared to those of other fleets. Besides, the Japanese Captain Mochitsura Hashimoto complained that during the war Japanese submarines were iron coffins because of poor technical equipment. Also the opinion of the submarines expressed by Vice-Admiral Shigeru Fukudome, twice the Chief of Staff of the Combined Fleet, and Commanding Officer of the 2nd Air Fleet until mid-1944, was negative. He admitted that the Japanese submarine design and equipment was inferior to the US, and that they were attacked before they could get close to their target or before they could get far enough from it. The history of the Pacific War proves that this was not always the case, especially in the early period.



Technical inspection and refuelling of E14Y1 Model 11 seaplanes at Kure air base. The seaplanes belonged to the 6th Fleet.



A group of E14Y1 Model 11 seaplanes at Kure naval air base. They participated in reconnaissance operations over the Aleutians, Madagascar, Africa, Australia, Tasmania, New Zealand, etc.

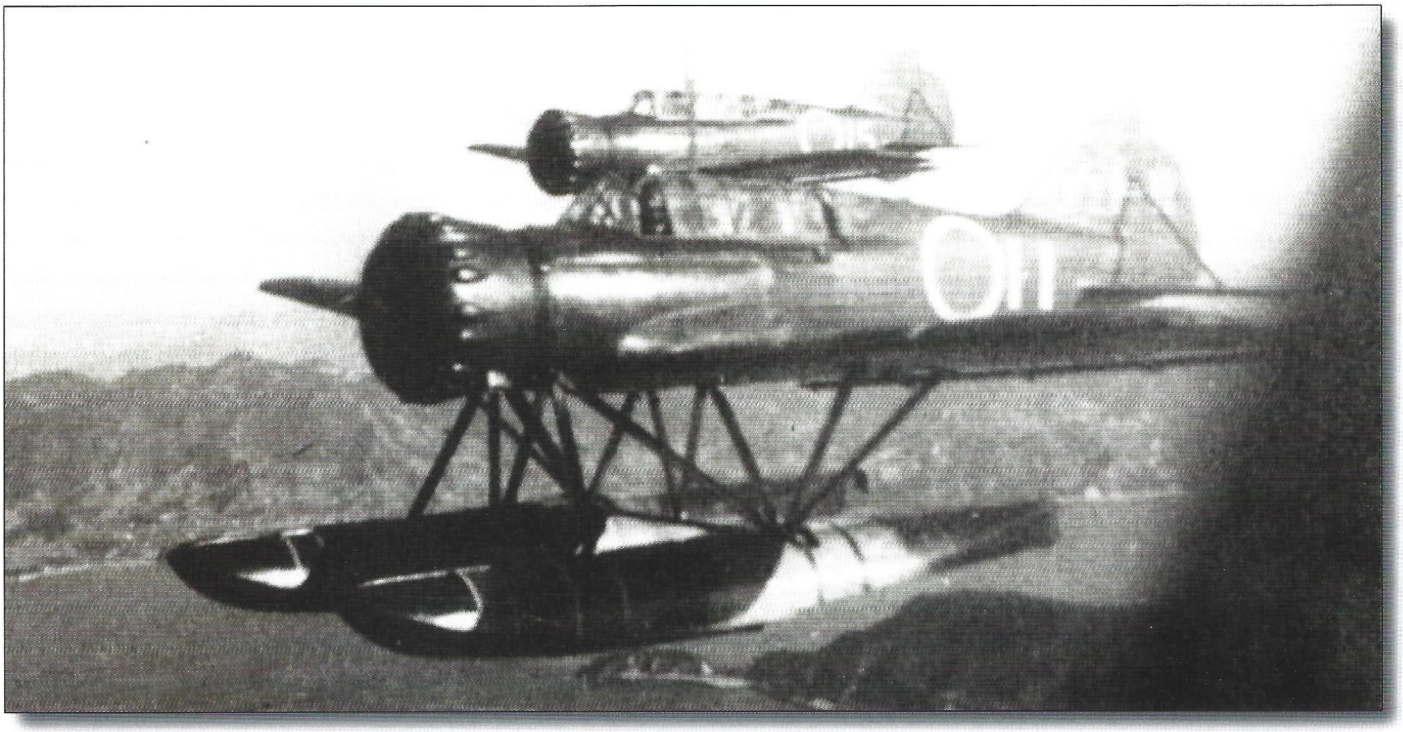
Reconnaissance duties were performed by large vessels, especially those equipped with hangars for small reconnaissance seaplanes. Performance data of the E9W1 and E14Y1 seaplanes were a secret that was not easily discovered by the US intelligence services. Before any details were known, the Americans gave them code names, "Slim" for the biplane and "Glen" for the monoplane.

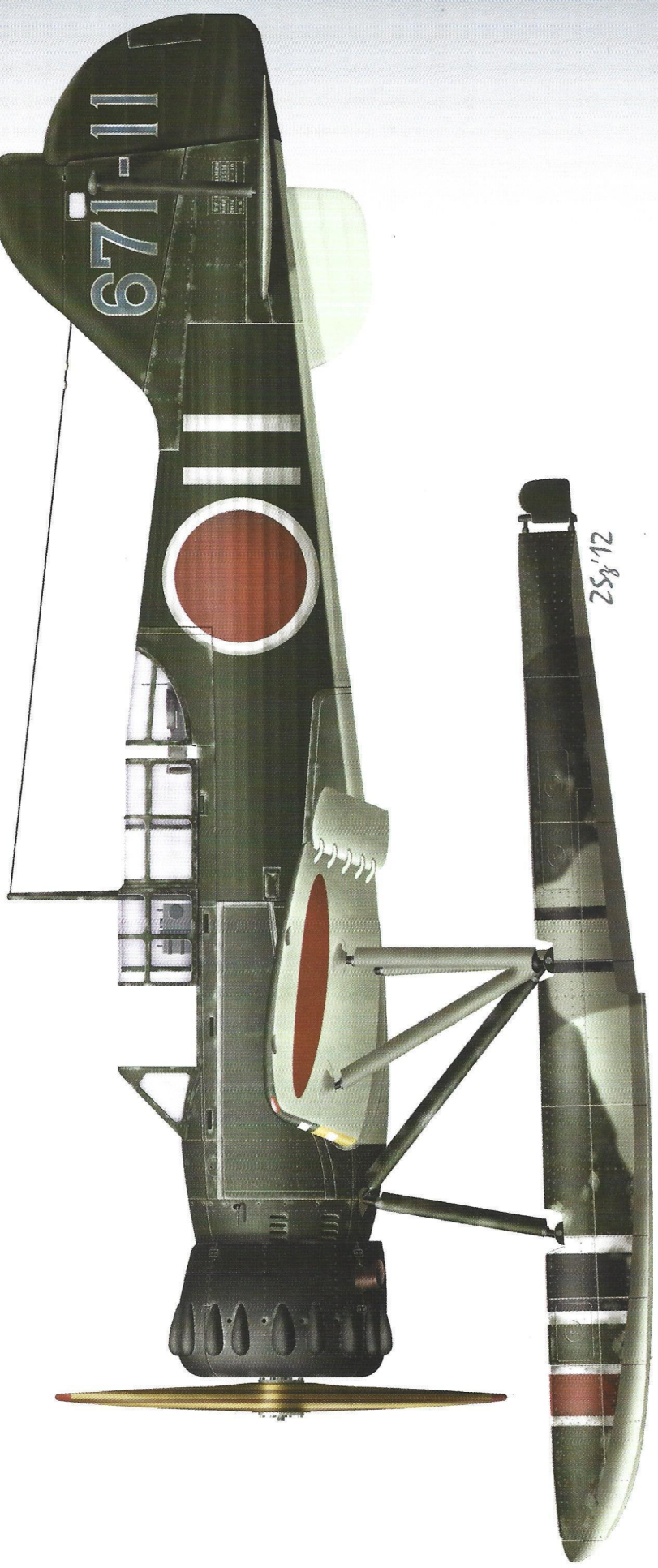
Before describing combat operations of the submarines with reconnaissance seaplanes on board, it has to be mentioned that, although in peacetime conditions preparation for take-off of the aircraft could be quick, during the war such operations took much more time, because the submarine captain had to make sure first there was no enemy around. When far from the enemy, starting the aircraft on a submarine took no less than 30 minutes from the moment she surfaced, and the time never exceeded one hour. It took little less time to hoist the aircraft aboard, disassemble and place it in the hangar, so under real threat to the submarine the seaplane was pushed off the deck and rapid diving was started immediately.

Similarly, the submarine was not always able to wait for her aircraft to return once it had taken off. So the pilots faced a very demanding task of finding their tiny 'airstrip' in the sea, often under reduced visibility. This required experienced, and brave, pilots.

In early December 1941 the *Rengo Kantai* (Combined Fleet) included eleven submarines, of which only six (*I-7*, *I-8*, *I-9*, *I-10*, *I-19*, and *I-25*) were able to carry the Watanabe E9W1. The Kugisho E14Y1 Model 11 seaplanes were allocated, starting from the second half of 1942, on such submarines as *Ko class 1-Go* (*I-9*, *I-10*, *I-11*, and *I-12*) and *Otsu 1-Go* and *Otsu 2-Go* class

E14Y1 Model 11 seaplanes with code numbers 671-15 and 671-11, belonging to the 6th Fleet, in training flight over the Inland Sea. Forward fuselage had duralumin skin, the rest was fabric covered. The difference of reflective surfaces can be seen. Also the bottom of the fuselage under the wing was aluminium covered.





E14Y1 671-11, the 6th Fleet at Kure naval air base.

(I-*15*, *I-17*, *I-19*, *I-21*, *I-23*, *I-25*, *I-27*, *I-29*, *I-31*, *I-33*, *I-35*, *I-36*, *I-37*, *I-38*, *I-39*, *I-40*, *I-41*, *I-42*, *I-43*, *I-44*, *I-45*, *I-54*, *I-56*, and *I-58*). *Ko* class submarines were fitted with large cylindrical hangars fitted ahead of the conning tower, where the catapult was also located. Such an arrangements allowed easier servicing of the seaplane during take-off preparations.

During the attack on Pearl Harbor, *I-25* with an E9W1 on board patrolled 120 miles north of Oahu with three other submarines. Warrant Officer Nobuo Fujita was the seaplane pilot. His seaplane was damaged during loading and was unserviceable, so he failed to take part in the planned reconnaissance mission prior to the attack.

The first combat mission of the 'submarine air force' was a reconnaissance sortie on the morning 17th December 1941. It was flown over the US base at Pearl Harbor, as the Japanese high command wanted to learn the extent of destruction after Admiral Nagumo's surprise attack of ten days earlier.

An E9W1 seaplane took off from *I-7* and successfully carried out its sortie, without being spotted by the Americans. It is not quite clear whether it was recovered by the ship upon return. It is known, though, that the pilot and observer returned to the submarine with no problem. The undamaged operation of the seaplane and its carrier proved to them the ability to perform reconnaissance over the most remote and well protected enemy objectives.

It is noteworthy that there is no mention of any photos taken during the reconnaissance. That is no surprise, because at the time no Japanese seaplane was fitted with special cameras, and the Japanese did not use hand-held cameras.

Satisfied with this first success, the Navy HQ decided to cover Pearl Harbor with systematic observation. Therefore, on 1st January 1942 the E9W1 from submarine *I-9* carried out another reconnaissance sortie over Oahu. Upon completion of the task the seaplane was successfully hoisted aboard the submarine.

Another combat action, again off Oahu, was carried out on 23rd February 1942. Submarine *I-9* launched its E9W1 seaplane for reconnaissance, and the aeroplane not only inspected the American base, but also detected the destroyer USS *Radford*. Presence of the Japanese aircraft was a great surprise for the Americans, who were confident in their radar network, and were sure there was no threat from the enemy. Once again the Japanese Navy HQ received valuable information, while the reconnaissance seaplane returned to its submarine with no problem. It is not clear what occupied the strong American anti-aircraft defence, equipped with radar.

There followed a long break, and the next attempt of reconnaissance over Pearl Harbor was not undertaken until the autumn of 1943. Its main goal was to specify the information possessed by the Japanese Navy HQ that large American forces were grouped in Hawaii, preparing for a new operation. For that reason in mid-September the submarine *I-26* with an E14Y1 seaplane on board approached Hawaii. However, attempts to launch the seaplane on 20th and 27th September failed due to problems approaching the American base. Subsequent attempts to get close to Hawaii failed, too.

Following desperate attempts to approach the strongly defended area to within aircraft range, the captain of the Japanese submarine *I-36*, already nearing the end of her endurance, took the cruel but only possible solution. On 19th October 1943 the E14Y1 took off heading for Pearl Harbor, which was 300 miles away. This was a clearly suicidal mission, as the pilot stood no chance whatsoever to return. Since the pilot flew to certain death, he did not take an observer with him. And that was what happened – the pilot announced over the radio that he was over Pearl Harbor and could see four battleships, four aircraft carriers, five cruisers and seventeen destroyers, and then he disappeared without trace.

The last reconnaissance of Pearl Harbor by an E14Y1 was recorded on 25th November 1943. The E14Y1 took off from the submarine *I-19*. The sortie was successful, but on the return leg the submarine was sunk by the American destroyer USS Radford. Afterwards no such reconnaissance missions were possible, due to reinforced radar protection far from Pearl Harbor, which prevented the Japanese submarines from remaining too long on the surface.

Reconnaissance flights over the Southern Pacific

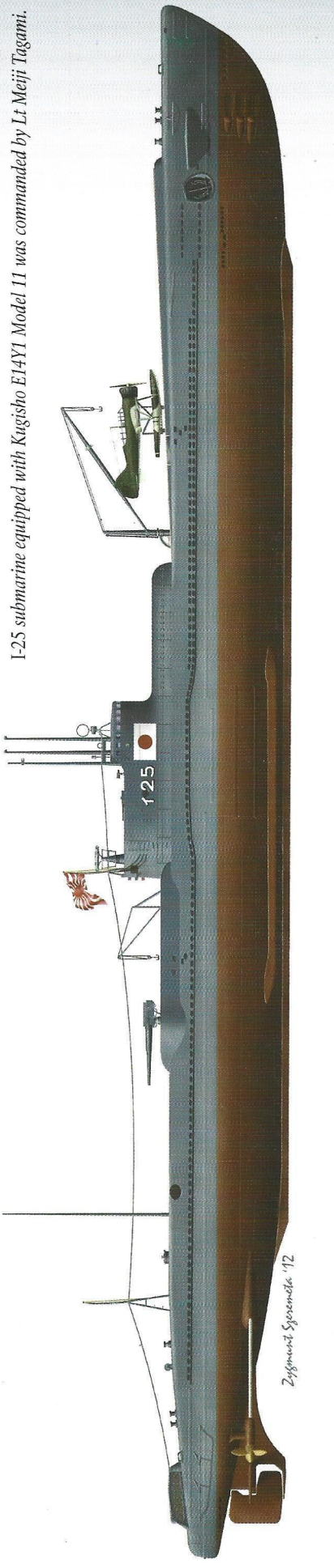
On 5th February 1942, when Japanese troops continued their unrestrained march into Malaya and Netherlands East Indies, the submarine *I-25* sailed from the naval base at the Kwajalein Atoll in the Marshall Islands for a reconnaissance mission in the South Pacific. The Imperial Japanese Navy was then equipped in almost all ship categories with the largest warships in the world. This applied also to *I-25*. Completed in one of the Mitsubishi shipyards at Kobe only fifteen weeks earlier, the submarine was already a veteran of the attack on Pearl Harbor and took part in operations off the US West Coast. The submarine was much larger than standard submarines of the Royal Navy, *Kriegsmarine* or US Navy.

The hull length of *I-25* was 108 m, her displacement around 2,600 t, and range exceeded 14,000 NM. The submarine was powered by two Ishikawajima diesels rated at 12,400 hp, which gave the ship a maximum surface speed of 23.5 kts. The submerged speed was 8 kts, and was provided by two electric motors rated at 2,000 kW. The wide hull was welded of 25 mm thick steel plates and accommodated the complement of twelve officers and 88 sailors. The armament was also impressive. On the after-deck a 140 mm gun was installed, whose projectiles could pierce the armour of small and medium enemy ships. The conning tower housed a 25 mm AA cannon. In the forward store were seventeen oxygen-propelled Type 95 torpedoes, which were much more efficient than any US Navy torpedoes.

The most important task of *I-25* was long-range reconnaissance missions with the help of an E9W1. *I-25* was commanded by Cmdr Meiji Tagami, a graduate of Class 51 at the Imperial Japanese Naval Academy in Etajima. He had eight years of experience in commanding a submarine. During the attack on Pearl Harbor Cmdr Tagami's boat, together with three other submarines 120 NM apart formed a barrier north of Oahu Island with task of preventing a possible American attack on the Japanese strike force. Later, when Admiral Nagano's aircraft carriers withdrew triumphantly westwards, *I-25* together with eight other submarines sailed eastwards to carry out patrol missions off the US West Coast. The submarine operated mostly near Cape Disappointment, Washington, where she attacked a transport ship sailing along the shore and 10 NM from land. The ship admittedly escaped, but later she ran aground at the mouth of the Columbia River. At the same time nine Japanese submarines had received orders to bombard military installations on the US West Coast, on 24th December 1941. However, due to shortage of fuel, the order was cancelled

After the first wartime patrol, on 11th January 1942, *I-25* anchored at Kwajalein naval base, where she was thoroughly inspected, refuelled and equipped for future missions. For this purpose the submarine moored aside a tanker. On 1st February 1942 46 aircraft from the aircraft carrier USS Enterprise made an air raid against the Marshall Islands. After the raid *I-25* together with other submarines carried out a defensive patrol in the neighbouring area. The search for enemy ships ended on 3rd February.

Cmdr Meiji Tagami's new goal was to carry out reconnaissance missions over Australian harbours in Sydney, Melbourne and Hobart; to sail through the Tasman Sea, to reconnoitre New Zealand harbours in Wellington and Auckland, and to send by radio information about the concentration of Allied forces.



I-25 submarine equipped with Kugisho E14Y1 Model 11 was commanded by Lt Meiji Tagami.

Reconnaissance flight over Sydney harbour on 17th February 1942

On Sunday 14th February 1942, the Japanese submarine *I-25* appeared a few miles from Sydney harbour. The signalling lights in the harbour were clearly visible from her conning tower. Commander Meiji Tagami decided to sail 100 NM southeast from Sydney, because bad weather prevented immediate take-off of the reconnaissance seaplane E9W1 from the catapult. At daylight the submarine stayed submerged and surfaced only at night. Eventually, on Monday 16th February 1942 Cmdr Tagami agreed that the seaplane would take-off. For this purpose the pilot, WO Nobuo Fujita, started preparations for a reconnaissance flight over Sydney harbour.

The assembly of the seaplane started at 3.30 a.m. on Tuesday, 17th February 1942. One hour later the seaplane was ready to take-off. The observer/gunner was PO Shoji Okuda. The seaplane was launched from the catapult and set course for Sydney, at a cruising speed of 90 kts. After the seaplane's take-off *I-25* sailed northwards at 18 kts.

Fujita approached Sydney at 2,500 m from the direction of La Perouse, and crossed Botany Bay. Then he headed to northeast to the town of Parramatta and over the harbour. Later Fujita descended to 1,000 m to avoid clouds. Despite a partial black-out he could see a lot of lights at Garden Island, the naval base, and the Macquarie lighthouse. PO Okuda counted 23 ships anchored in the harbour. Among warships he observed a large, 10,000 t, three-funnel warship, two destroyers and five submarines.

At daybreak Fujita ended his mission. Crossing North Head, he headed back to *I-25*. Fujita flew at 50 m, and on the way spotted two inbound freighters. When he reached the estimated meeting point, he could not find the submarine. He decided to send a short encoded signal to show his position. Unfortunately, his radio failed. Eventually Fujita spotted his submarine on the horizon. Approaching the submarine, he banked right and left to signalise 'friendly aircraft'. Yellow flare bursts from the submarine signalled permission to alight. Fujita landed next to the submarine, and his plane was lifted aboard with the crane. By 7.30 the seaplane was disassembled and inside the waterproof hangar. Cmdr Tagami ordered the submarine to dive and *I-25* sailed southwards at 14 kts.

Reconnaissance flight over Melbourne and Port Philip harbour 26th February 1942

I-25 sailed southwards for next mission – a similar reconnaissance flight over Melbourne. Cmdr Tagami planned to launch the seaplane in the vicinity of Cape Wickham on the northern end of King Island, in the western part of the Bass Strait halfway between Victoria and Tasmania.

On 20th February 1942, when the submarine was sailing along the western coast of Tasmania, the sea calmed down. Cmdr Tagami decided to cross the Bass Strait as far as Cape Otway and launch the seaplane near to Cape Wickham. At periscope depth and 10 miles offshore he made a few observations of the south-eastern coast of Victoria. The submarine turned and after 37 miles appeared again in the vicinity of Cape Wickham. Here Tagami observed several freighters sailing through the Bass Strait eastwards. Then he waited a few days at the northern end of King Island for the weather to be suitable for launching the seaplane. After sunset on 25th February 1942 Tagami surfaced his submarine and sailed to a position distanced about 10 miles from the northern shore of Cape Wickham. When *I-25* waited for the wind to be suitable for take-off, Nobuo Fujita and Shoji Okuda made ready for the flight over Melbourne.

Before dawn on Friday 26th February 1942, after two flying hours, Fujita and Okuda flew over the Bass Strait in the vicinity of Cape Otway, and headed northeast along the shore towards Point Lonsdale lighthouse, close to the entrance to Port Philip harbour. Then they flew towards clouds over Melbourne. They passed over the Bellarine Peninsula to Portalington, and on the way they flew over the town of Geelong, 16 km from Lake Connewarre. Now they headed towards Portalington where for 24 km they flew along the Port Philip shore. Since all the time they flew in clouds, they were not sure about their current position. Finally they descended to 1,500 m to make

possible observation of the ground. At approximately 6.45 they went down to 300 m and surprisingly emerged over the RAAF base at Laverton. They spotted 12 Wirraways, and a few Lockheed Hudsons and Avro Ansons. On the ground an alert was sounded and two aircraft took-off to intercept the Japanese intruder. However, they found nothing, but later three Wirraways were transferred to Bairnsdale airfield.

Meanwhile Fujita withdrew into the clouds and flew towards Melbourne, on the way passing over Altona. He emerged from the clouds from time to time to reconnoitre the terrain below. However, the response of the Laverton RAAF aircraft made him cautious.

When Fujita flew over Williamstown, the crews of four AA guns were already carrying out trial firing. The Japanese aircraft was spotted, but there was a delay whilst authority was sought for permission to open fire. This came too late, because Fujita made a turn and flew away towards Port Philip harbour.

Fujita continued flying towards Melbourne along the river Yarra, heading to the central part of Melbourne and docks in the mouth of the Yarra. En route he spotted a few ships in repair docks. Fujita continued flying south over St. Kilda, Brighton and Sandringham. Then he headed towards Frankston. Meanwhile Okuda in the rear seat observed the harbour, where he spotted 19 anchored warships, and in the area of the repair docks he saw six warships lined up, including a light cruiser and five destroyers.

Fujita found *I-25* near Cape Wickham lighthouse. He landed, the seaplane was quickly dismantled and stowed in the hangar, and *I-25* left this dangerous zone at 14 kts. Cmdr Tagami headed to the west coast of Tasmania, on the surface. Fujita's next reconnaissance flight was planned for 1st March 1942.

Reconnaissance flight over Hobart and Tasmania on 1st March 1942

The next goal for Tagami's submarine was the eastern coast of Tasmania. The seaplane was to take-off in Great Oyster Bay, situated in the centre of the eastern coast of Tasmania. Tagami entered the bay at night under a full moon.

Fujita decided to take-off from the sea, without help of the catapult. The E9W1 was assembled and lowered onto the water. Two hours before dawn Fujita and Okuda took-off and headed south towards Hobart harbour. When they went by Cape Pillar, Fujita turned to southeast to bypass Tasman Island. Then he made a sharp turn and headed to Hobart from the south.

In the harbour he spotted five anchored freighters, but no warships. Then Fujita turned back and set course for his submarine, which he planned to reach at dawn. On the submarine preparations for hoisting the seaplane were in progress, when SLt Tsukudo saw a small freighter to the south. Happily, the freighter's crew did not see the Japanese submarine.

Once the seaplane was hoisted aboard, the submarine started to sway and the seaplane, suspended on the crane, started to swing, resulting in damage to a wingtip. Fujita was still in the cockpit when he heard the wing break. There were no spare wings aboard the submarine, so mechanics set about making repairs.

On 8th March 1942 Fujita carried out a reconnaissance flight over Wellington, New Zealand, and on 12th March 1942 he 'visited' Auckland. On 18th March 1942 Fujita and Okuda made a reconnaissance flight over Suva, the capital of the Fiji Islands. The last sortie was over Pago Pago harbour (Tutuila Island). All the information gathered proved useful for the IJN HQ, which sent submarines to areas of concentration of enemy warships

Reconnaissance flight over Sydney on 23rd May 1942

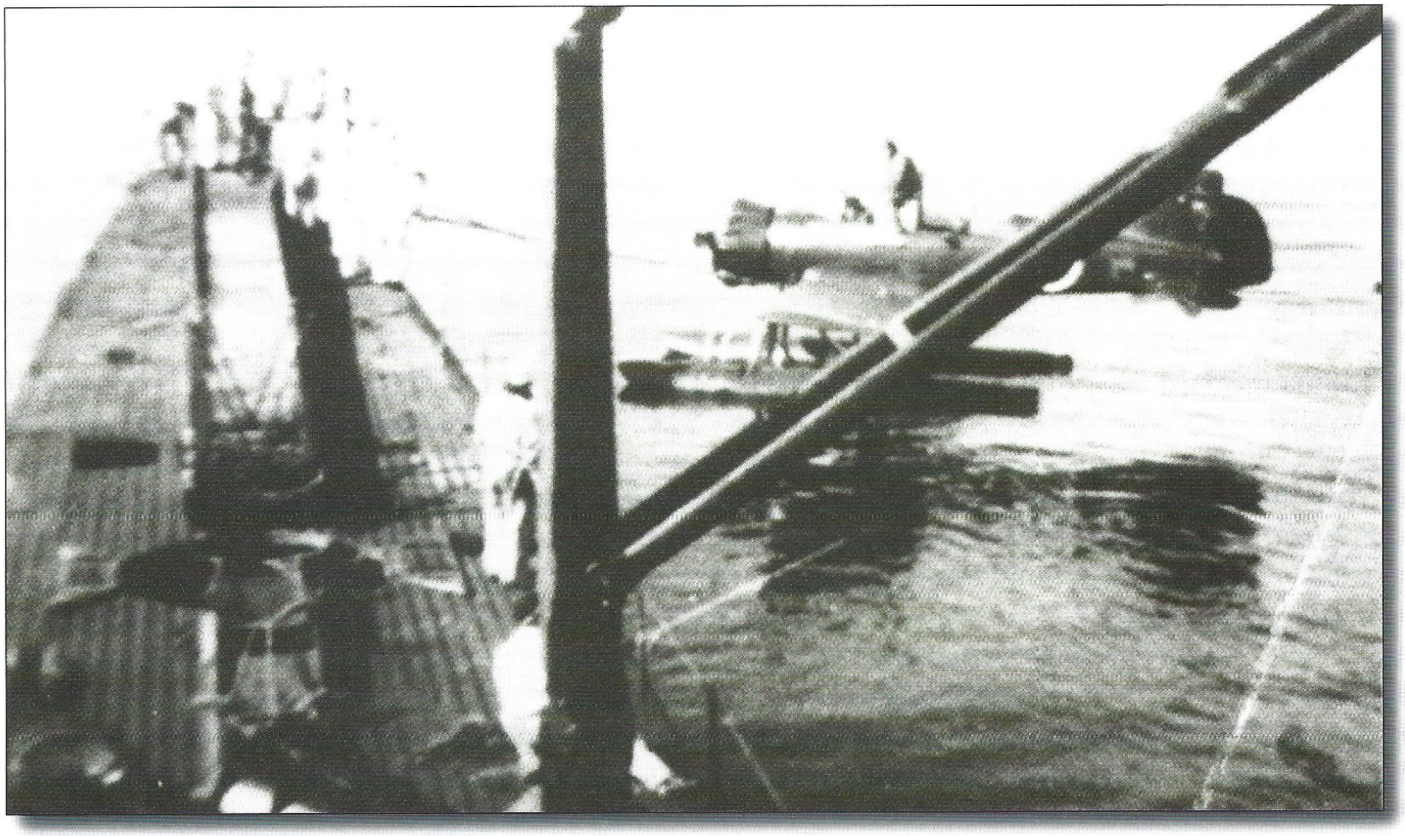
As a result of the experience gained from these flights, the 8th Submarine Squadron (8. *Kantai Fuzaku Teisatsutai*) was established, consisting of submarines *I-21*, *I-22*, *I-24*, *I-27*, and *I-29*. They operated mainly in Australian waters under the command of Capt Sasaki, and their task was to attack

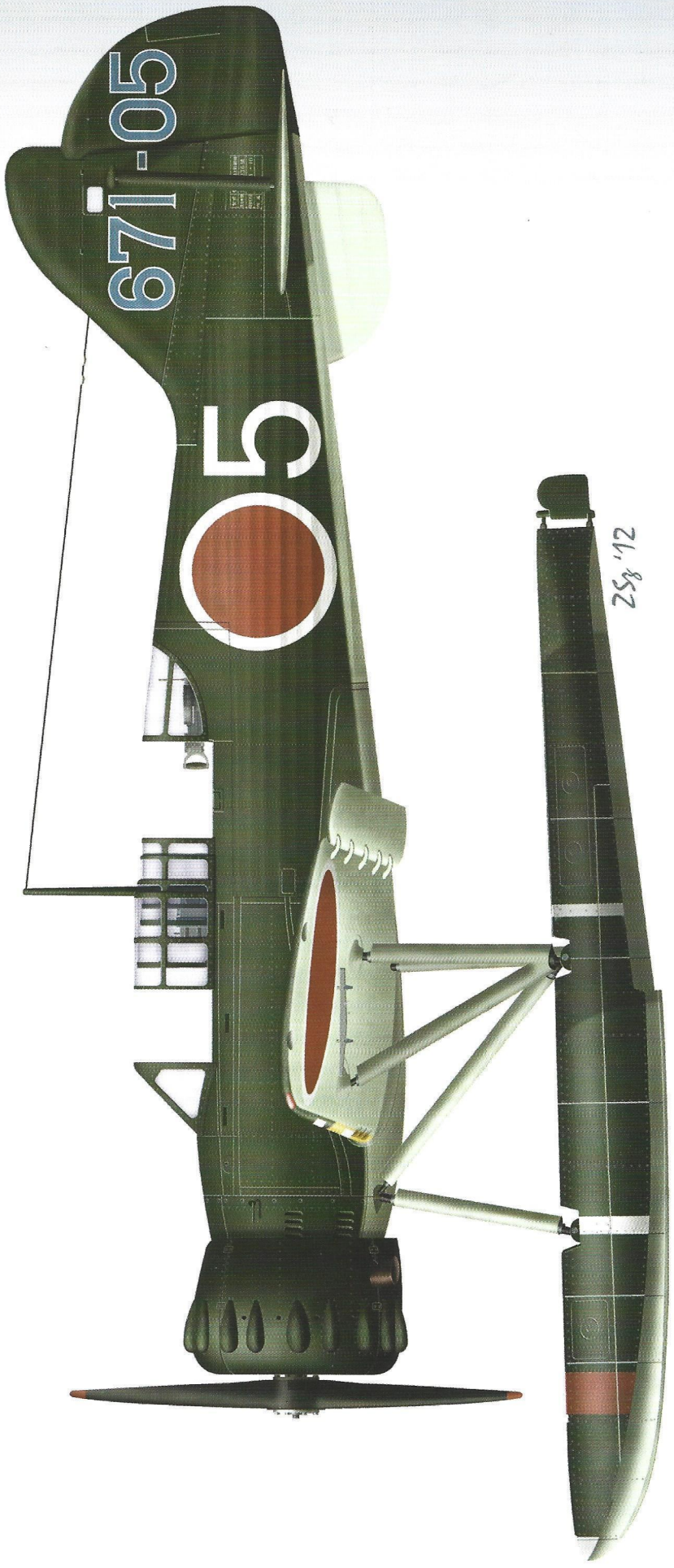
The E14Y1 Model 11 seaplane with code number 671-05, belonging to the 6th Fleet, in flight over the Inland Sea. Notice the bomb rack under the left wing. (See also page 112)

Allied warships in their own bases. *I-21* and *I-29* were equipped with E14Y1s, and other ships had in their hangars midget submarines with a crew of two. On 23rd May 1942 the submarine *I-29* launched its E14Y1 for a short flight over Sydney; its crew reported that they observed a significant number of warships in the harbour. During landing near to *I-29* the seaplane's wing was slightly damaged. At dawn 30th May, at 3.45, *I-21* launched its E14Y1 with Ensign Susumu Ito at the controls and observer Iwasaki. After a few circuits over Sydney harbour the observer sent a message to the midget submarines positioned at the harbour entrance. The seaplane was detected by AA defences and soon P-39 Airacobras of the USAAF 41st Pursuit Squadron took off to intercept the intruder. During landing the seaplane turned over and was damaged beyond repair.

Japanese submarines operating off the Australian east coast from July to August 1942 sank ten Allied merchant ships, according to Japanese reports. In fact, only three ships were sunk in Australian waters between Jervis Bay and Cape Howe, and all by *I-11*. This submarine carried out her first patrol off Sydney on 19th July 1942. During the patrol the submarine launched its E14Y1 with Yasushi Kuwashima at the controls.

Recovering an E14Y1 on return from a sortie. The white code showing its mother submarine is overpainted, or was censored for security reasons.





E14Y1 671-05 with bomb racks under the wing, the 6th Fleet at Kure naval air base

On 7th January 1943 from the Japanese naval base in Rabaul *I-10* and *I-21* sailed towards Australia. Their goal was to reconnoitre Allied forces in Sydney and Nouméa harbours. On 19th February 1943 *I-21* launched its E14Y1 with pilot Susumu Ito and observer Iwasaki for a flight over Sydney.

Flights over the Indian Ocean

After the Japanese conquest of South-eastern Asia, the submarine forces HQ decided to expand submarine operations into the Indian Ocean. In the spring of 1942 the 4th Submarine Squadron was formed at Penang, commanded by Noboru Ishizaki and consisting of eight submarines. Three smaller submarines (*I-16*, *I-18* and *I-20*) were equipped with midget submarines. The other two submarines, the somewhat larger *I-10* (4,150 t) and *I-30* (3,654 t) were equipped with E14Y1s. The squadron's submarines were supported by the auxiliary cruisers *Hokoku Maru* and *Airoku Maru*. On 30th April 1942 the group entered the Indian Ocean, tasked to find and destroy British warships belonging to the Eastern Fleet as well as coastal bases. On 2nd May 1942 an E14Y1 launched from *I-10* carried out a reconnaissance mission over Durban harbour, and a few days later, over Port Elizabeth. On the way back *I-10* once again launched her seaplane, which on 15th July flew a mission over Reunion Island, and on the next day another over Mauritius. Meanwhile, the E14Y1 from *I-30* carried out similar missions over Aden (7th May), Djibouti (8th May), and Zanzibar and Dar-es-Salaam (19th May), as well as over French Somalia.

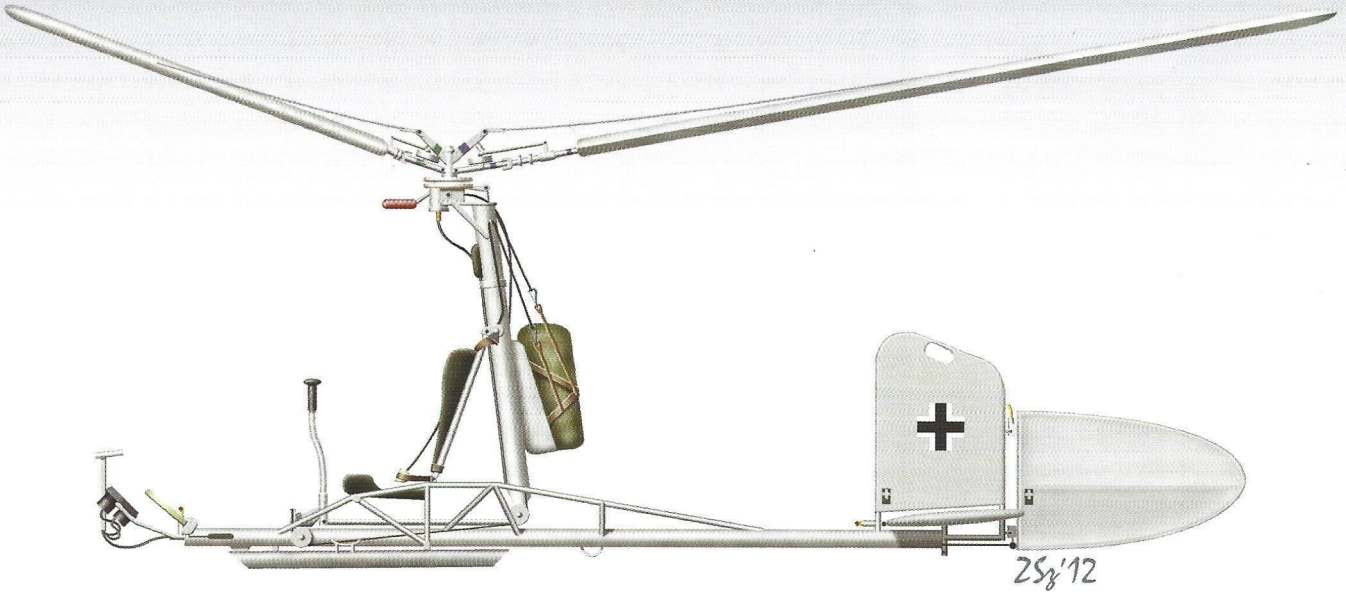
Soon afterwards *I-10* and *I-30*, together with another submarine equipped with two midget submarines, appeared off Madagascar, which had been occupied by the Allies. On 29th May at 22:30 (local time) *I-10* launched her E14Y1 to reconnoitre enemy forces in Diego Suarez. The seaplane was flown by Lt Toshio Araki, with observer/gunner PO Yoshiharu Ito. Araki headed to the southwest and after 15 minutes appeared over the harbour. He entered the harbour area at high altitude and then, according to procedure, reduced engine power and glided silently over the anchored warships. Meanwhile Yoshiharu Ito was able to identify the battleship HMS *Ramillies* anchored in the bay. Furthermore, in the harbour he spotted the destroyers HMS *Duncan* and HMS *Active*, the corvettes *Genista* and *Thyme* as well as the transport ship *Karania*, hospital ship *Atlantis*, tanker *British Loyalty*, troopship *Llandaff Castle* and an ammunition ship. Then Toshio Araki's seaplane was spotted and an air alert was raised. HMS *Ramillies* raised anchor and sailed towards the harbour, but eventually anchored in another location within the bay without reaching harbour. After two hours and ten minutes Toshio Araki landed close to his submarine.

The next day two Japanese midget submarines sailed towards the island with the task of blocking the harbour entrance. One of the midgets, commanded by Lt Saburo Akieda, managed to penetrate the harbour and to fire its two torpedoes. The first torpedo severely damaged HMS *Ramillies*, which was later towed to Durban for repair; the second sank the oil tanker *British Loyalty*. Akieda was attacked with depth charges from corvettes, but managed to beach his submarine and flee inland together with his crewsman, PO Takemoto. Both were shot three days later by Royal Marines.

However, the 'underwater aircraft carriers' were not always lucky. For instance, in 1942 *I-17* could not carry out reconnaissance flights over Colombo and Trincomalee, Ceylon. The British deployed there very heavy AA defences, therefore the Japanese submarine did not risk launching her seaplane. In August 1943 *I-17* was sunk while pursuing an Allied convoy, 60 miles south of Nouméa on New Caledonia.

Exchange of Fa330 for E14Y1

During *Kriegsmarine* operations in the Indian Ocean, German Focke-Achgelis Fa330 *Bachstelze* reconnaissance gyro gliders were twice supported by E14Y1 Glens which took-off from Japanese submarines.



Fa 330 Bachstelz, *standard equipment on German submarines in the Indian Ocean.*

In the memoirs of these U-boat crews, there are suggestions that in October 1944 on the Indian Ocean a German Fa330 was exchanged for an E14Y1. According to other information, two Fa330s of *U-862* and *U-196* were exchanged for an E14Y1, also in October 1944. It was impossible for U-boat crew to disassemble an E14Y1 and stow it in their U-Boat at sea. *U-862* was actually not at the sea in October 1944, but was in dock in Singapore from September to November 1944. Therefore, the exchange on the Indian Ocean can be discounted.

However, it is possible that this exchange was actually carried out, but not at sea. In April 1944 there were at least two E14Y1s stationed in Penang for supporting Japanese submarines and U-Boats. No information is available about the parent units/submarines of these E14Y1s, but there is a possibility that one of them was exchanged for Fa330s of *U-196* in Penang and *U-862* in Singapore in October 1944. *U-862* was taken over by the Japanese Navy in Singapore in July 1945 and renamed as *I-502*. The fate of its Fa330 is not known.

Another possibility is that those Fa330s were given to the Japanese Navy in return for an E14Y1 transferred to Germany by *I-30* in August 1942.

Fa330 in flight.

Above: Poor quality, but the only photo of E14Y1 flying over Penang. One of three stationed there. Note the white border of the Hinomaru. ***Below**: E14Y1 Model 11 seaplanes, with code numbers 671-05 and 671-15, in formation over Kure naval base. The inverted 'W' struts connecting the floats with the fuselage are shown to advantage. Note also the deep recesses in the floats, to which the struts are attached.*

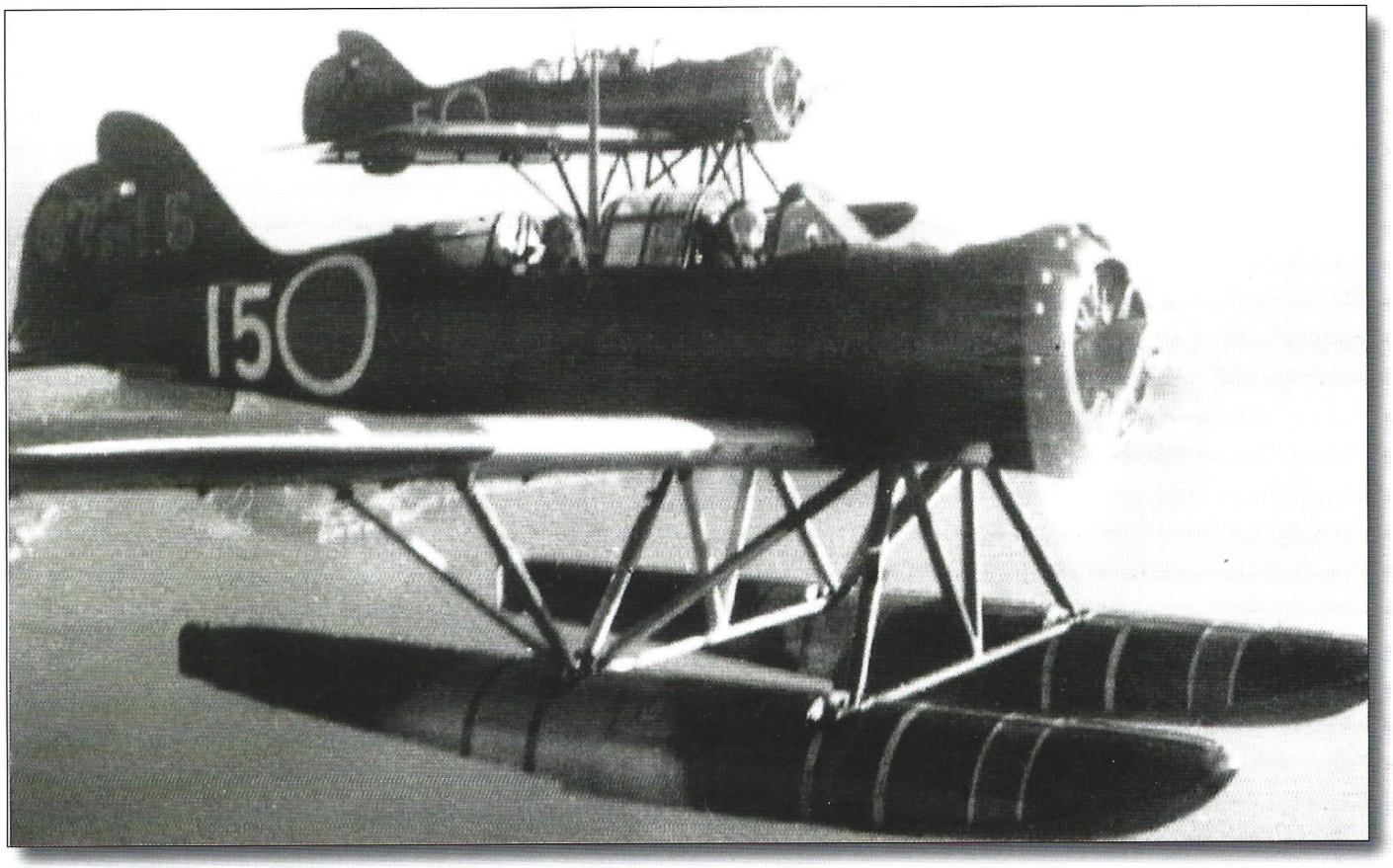
E14Y1 in Penang

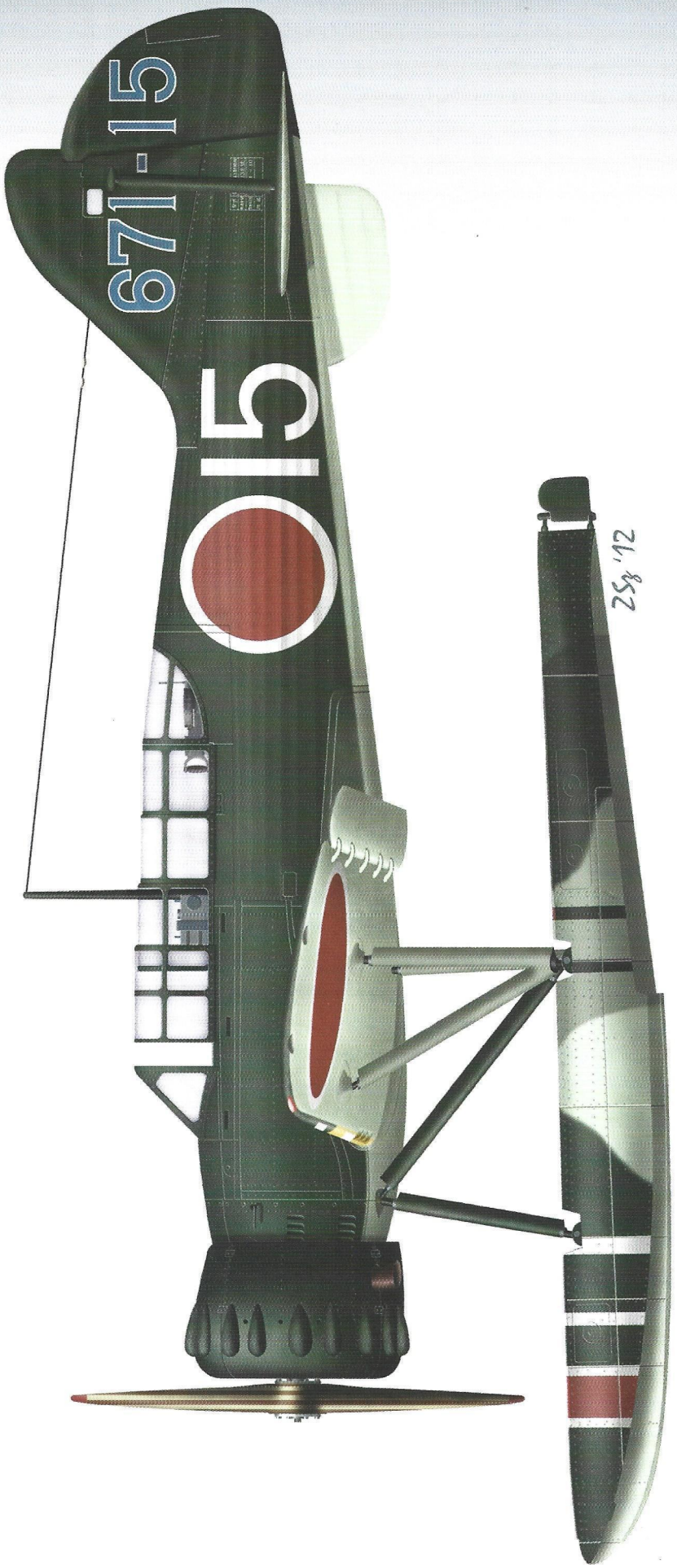
In Penang, the German and Japanese navies had a good relationship. The German Navy sent their U-Boats to Penang from August 1943 and they acted as the "*Monsun Gruppe*" (Monsoon Group) until 1945. The "East Asia Navy Special Service Air Command" was established in Penang on 1st March, 1944, and began operating two Arado Ar196 seaplanes for defending in- and outgoing U-boats. They carried two small bombs under the wing. They wore Japanese national markings, though it is unknown if they were on original *Luftwaffe* camouflage colours or on supplied Japanese navy aircraft colours.

The Japanese navy also operated *I-Go* submarines from Penang, and the seaplane base in Penang operated their seaplanes to support submarines until August 1944. E14Y1s also operated in Penang for supporting other submarines. It is known that one E14Y1 of *I-37* and two E14Y1s were stationed in Penang in April 1944. All the Ar196s in Penang were transferred from Penang to Jakarta later in December 1944. The photo of E14Y1 taken in Jakarta just after the war may be the one having been transferred with Ar196s.

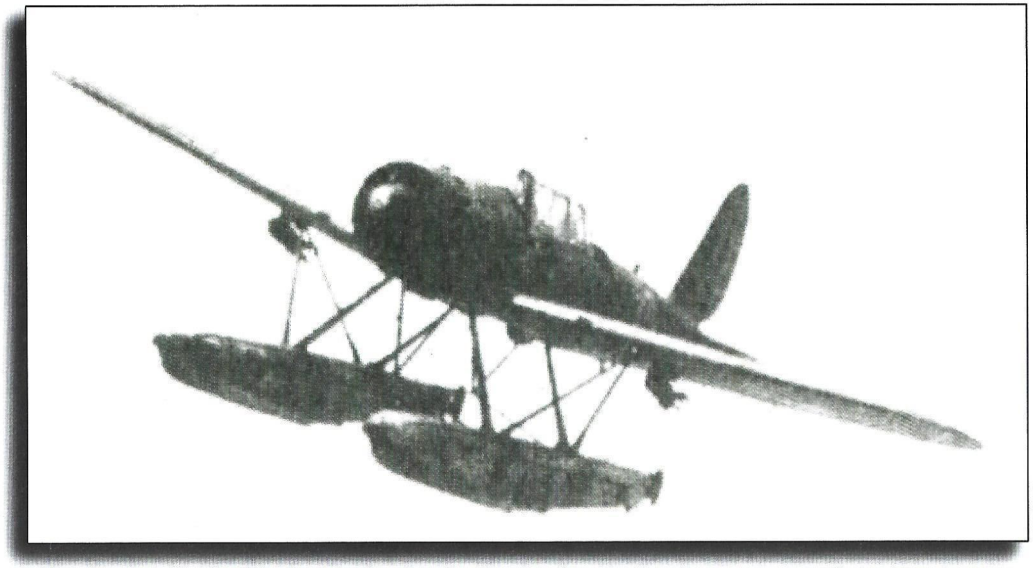
Seaplanes in the North

Submarines equipped with seaplanes were used with varying success in the far north. In late April/early May 1942 submarines carried out active reconnaissance over the Aleutians. Six submarines took part in these operations, including *I-19*, *I-25*, and *I-26*. The first mission during this operation was a reconnaissance sortie flown by an E14Y1 from *I-25* on 27th May over the east coast of Alaska, over Kodiak. The information obtained was necessary for the Japanese intelligence services that planned a diversion on Dutch Harbor. That attack was supposed to distract American attention from the planned attack on Midway. The reconnaissance operation was considered so important that another submarine, *I-26*, waited in reserve with an empty hangar in case *I-25* was unable to pick up her seaplane upon return from the reconnaissance sortie.



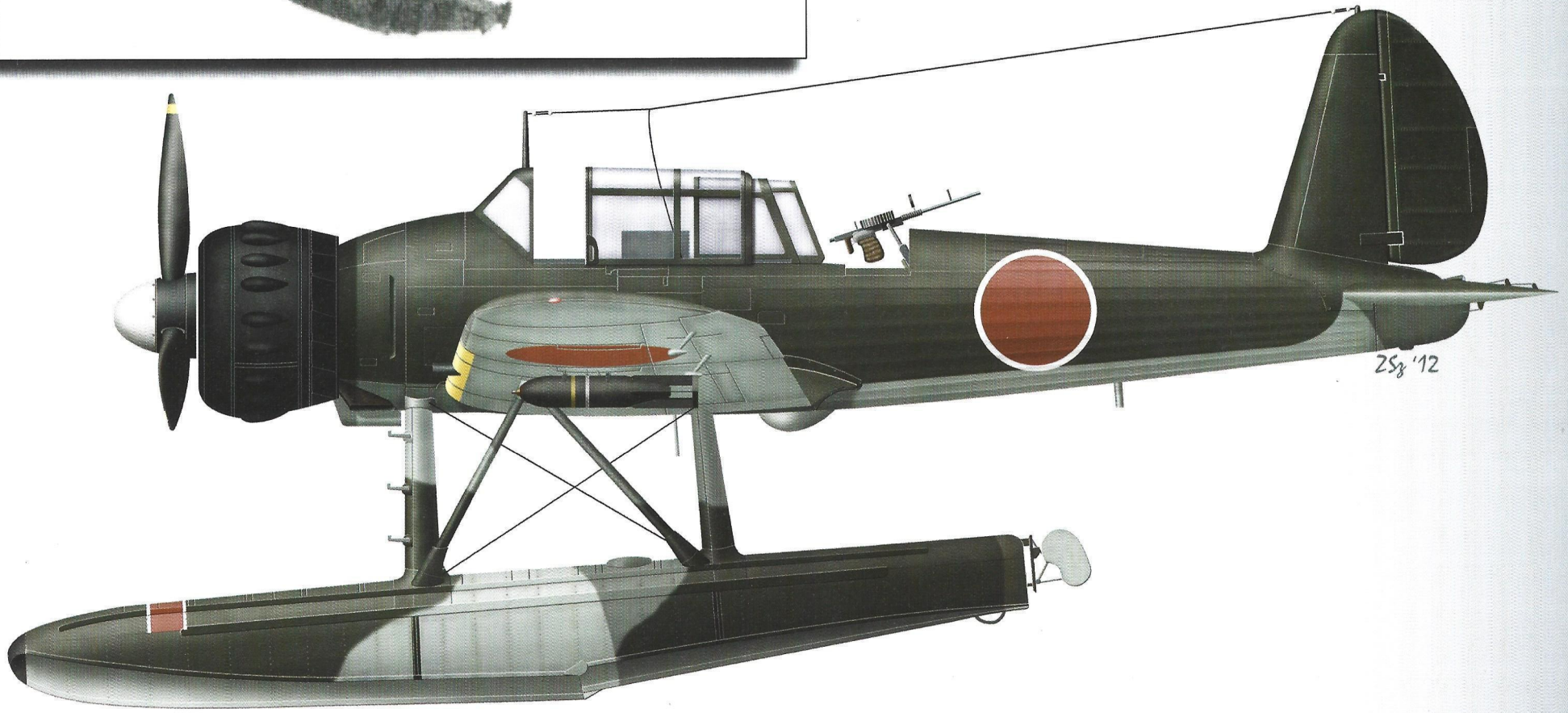


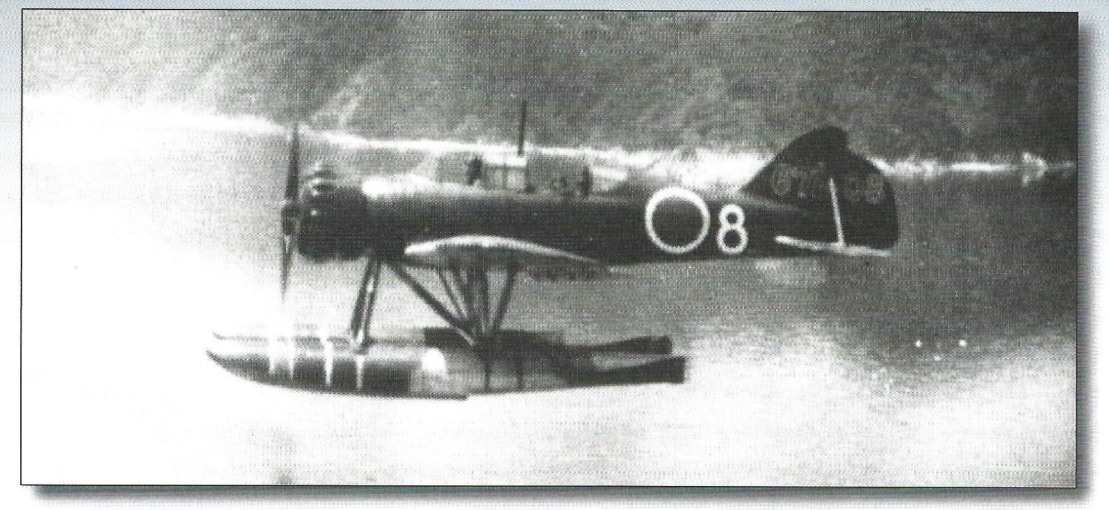
E14Y1 671-15, the 6th Fleet at Kure naval air base.



Arado Ar 196 with Japanese markings in flight over Kriegsmarine *navy base in Penang. Aircraft with 50 kg bombs under wings.* Hinomaru *with white outline.*

Below: *From March 1944, under the name of 'East Asia Navy Special Service Air Command (Penang), two Ar196 supported U-boats in Penang, carrying two 50 kg bombs. They seem to have been painted RLM72 Black Green / RLM65 Light Blue, wearing Japanese national marking.*





The E14Y1 Model 11 seaplane with code number 671-08 belonged to the 6th Fleet.

The E14Y1 from *I-25* successfully carried out reconnaissance over Kodiak Island, and in their desire to carry out their duty the Japanese often took risks. For example, on one occasion the seaplane from *I-25* took off in the vicinity of an American ship, which however failed to spot it, fortunately for the Japanese. Upon return from the reconnaissance sortie the seaplane was hurriedly hoisted on board, as an American destroyer appeared nearby and the Japanese ship had to submerge rapidly.

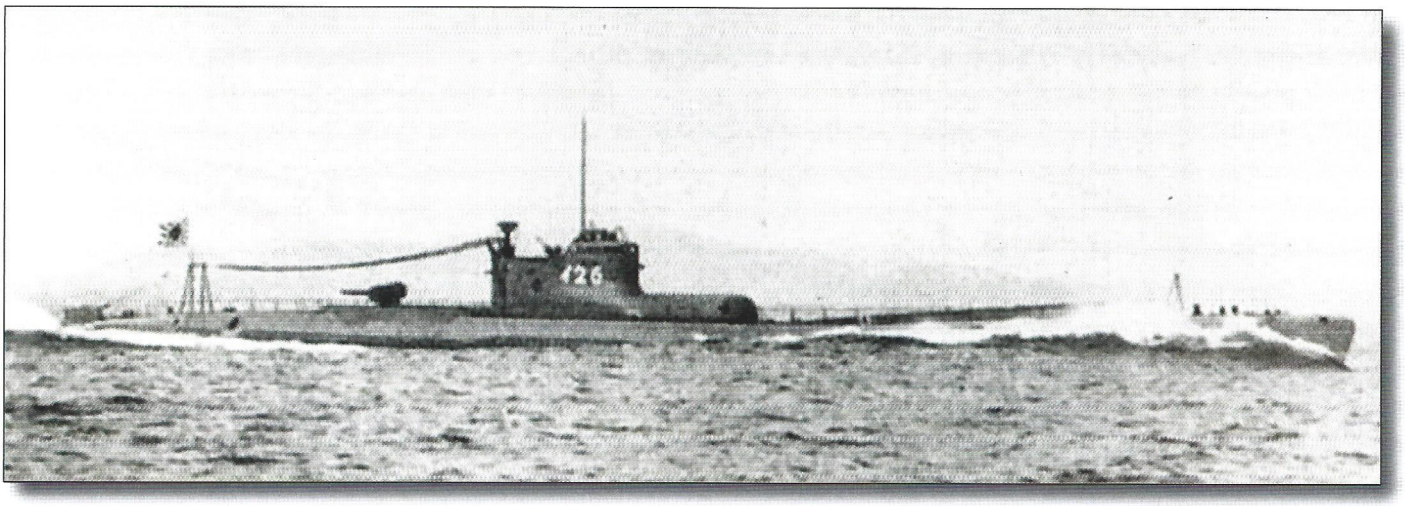
The *I-19* was less fortunate. She was spotted by American aircraft whilst the crew prepared the E14Y1 for take-off. The submarine had to submerge immediately, leaving the seaplane on the surface. The entire reconnaissance operation of Japanese submarines in the Aleutian area was positively assessed by the HQ.

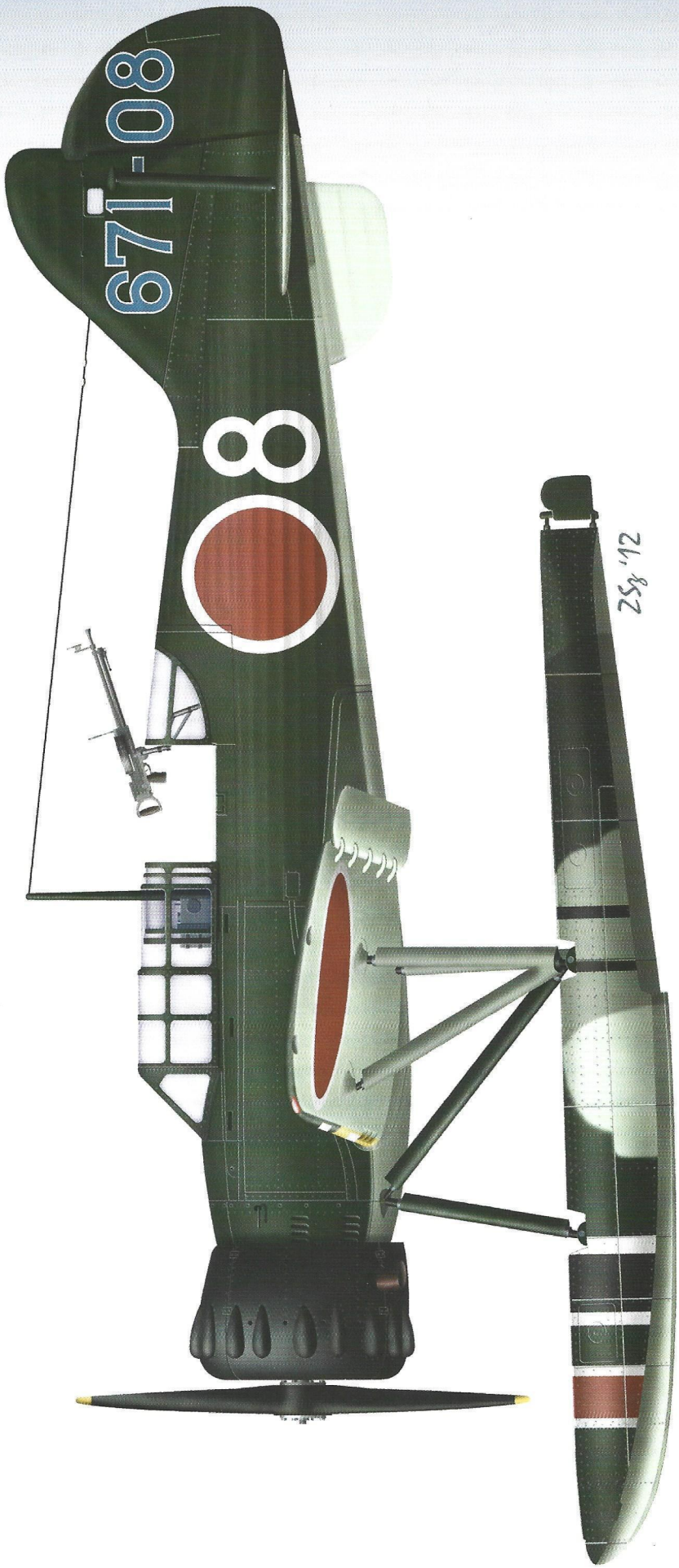
Bombardment of US territory

The idea to bomb America using submarines and seaplanes was put forward in December 1941 by pilot Warrant Officer Nobuo Fujita, who at the time served on submarine *I-25*. Nobuo Fujita had been drafted into the Navy in 1932 at the age of 21. He commenced his flying training the following year, and in 1935 he became a test pilot. During the surprise attack on Pearl Harbor his E9W1 failed to participate in the observation of the battlefield due to technical troubles.

Since Nobuo Fujita was considered an experienced pilot, his idea to use a seaplane launched from a submarine as a bomber against American coastal bases was given a positive hearing. When in December 1941 Nobuo Fujita's superior, Second Lieutenant Tatsuo Tsukudo, heard of Fujita's idea, he suggested that Fujita write it down so he could forward it to Navy HQ (Gunreibu). Fujita did that, and his letter was positively received and sent to the commander of the submarine *I-25*, Captain Meiji Tagami. Nobuo Fujita assumed that *Otsu 1-Go* class submarines with seaplanes on board could attack the Panama Canal, American military bases on the West Coast, and aircraft

Submarine I-26 *from which an E14Y1 (Glen) seaplane flew reconnaissance over the Aleutians on 17th May 1944.*





This and opposite page: E14Y1 671-08, the 6th Fleet at Kure naval air base

factories or shipyards. During the discussions it was also proposed to attack wooden housing in Utah, or the city of Eureka where a US Army regiment was based.

The following month, upon return to the home port at Yokosuka in *I-25*, a signal was received that pilot Nobuo Fujita should report immediately to Gunreibu (Imperial Japanese Navy HQ). As soon as Fujita reported there, he was surprised to be sent to a meeting with the Emperor's younger brother, Prince Takamatsu, who was one of the Imperial Japanese Navy commanders. In the presence of the Prince and an officer delegated by *I-25*'s captain, Nobuo Fujita received the task of bombing mainland USA. Another Navy officer, a former Japanese vice-consul in Seattle, gave him another instruction: "*it will be best if you bomb the forests*".

A large display board was laid in front of Nobuo Fujita, showing a large city some 75 miles from the California border. It was soon explained to him that "*North-east regions of the USA are covered with thick forests. Fire started in deep woods is very difficult to stop. Sometimes entire cities are destroyed by fire. If we could bomb a part of these forest areas, we would cause a lot of problems for the enemy. Such a situation could cause a large scale panic, and the inhabitants would have to realise that Japan can can even reach their homes, despite being 5,000 miles away*".

On 15th August 1942 *I-25* left Yokosuka and by early September arrived off Cape Blanco, Oregon. For a few days the ship waited for better weather to be able to launch the seaplane. The first such opportunity came on 9th September.

When just before dawn the submarine *I-25* surfaced, Fujita was ready for the flight. The pilot and his observer, Chief Petty Officer Shoji Okuda, boarded the E14Y1, which had meanwhile been assembled on the deck. Two out of six 76 kg incendiary bombs, Type 1 No.7 Mk 6 Bomb Model 3, were attached under the wings, to be used to start a great fire in the coniferous forests of Oregon. These were specially designed bombs that consisted of 520 incendiary pellets, bursting within 80 metres from the point of explosion, reaching a temperature of 1,500 °C.

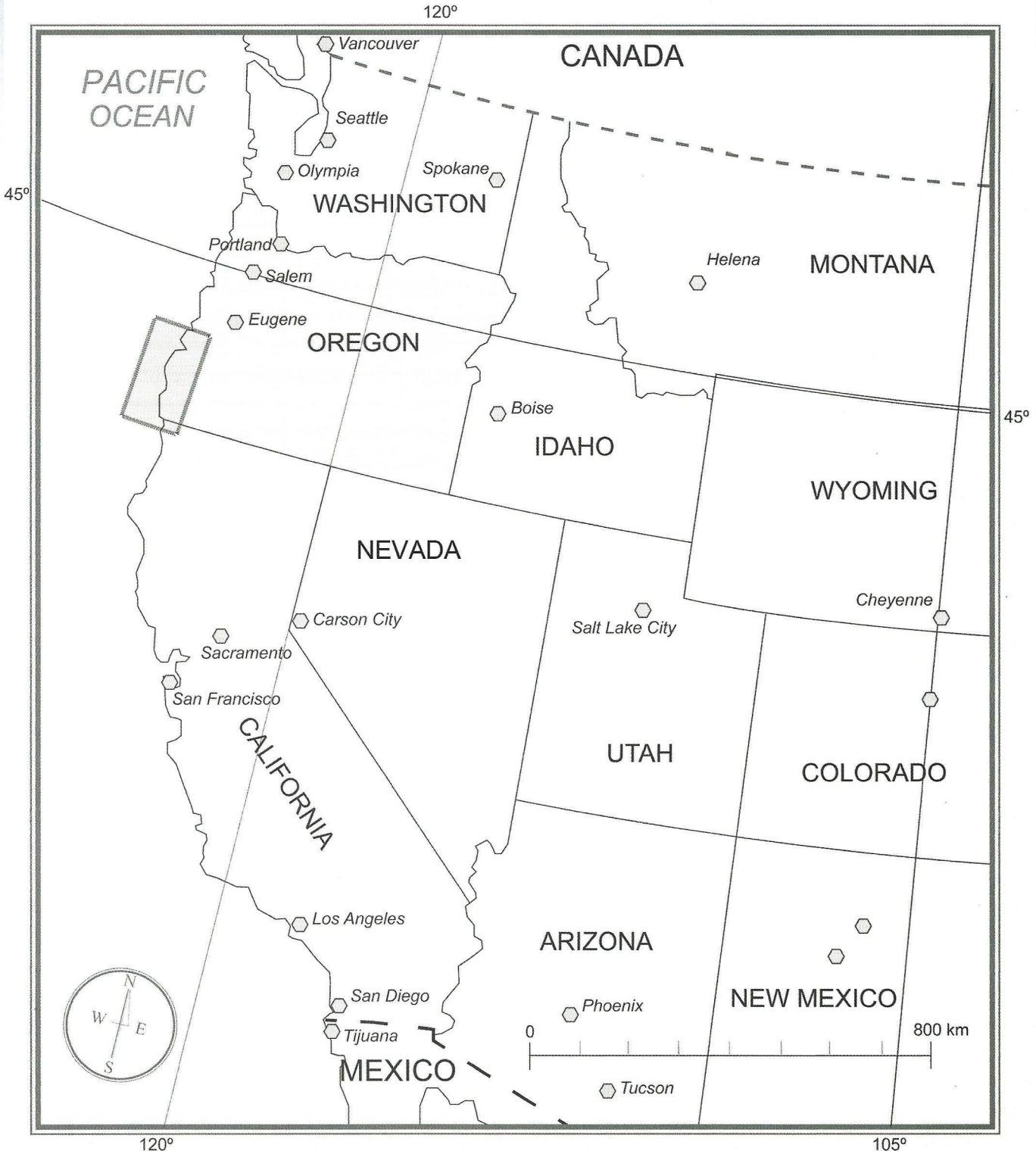
As soon as the sun appeared above the horizon, permission was given to launch the seaplane from the catapult. The E14Y1 headed north-east, aiming at the Cape Blanco lighthouse. Fujita had agreed with Okuda that they would drop the first bomb on a forested area deep inland some 80 km from the coast. It was a beautiful sunny morning by the time the first bomb exploded on the wooded slope of Wheeler Ridge, and Fujita and Okuda saw single blinking fires among the trees. Having flown about 8-10 km they dropped another bomb and this, too, exploded with a blinding white light. Then Fujita reduced altitude to tree-top height and headed towards the ocean, to meet his home submarine following the successful sortie.

Early in the morning on 9th September 1942, forest ranger Howard Gardner, on duty at the observation tower on Mount Emily, heard a strange sound, similar to a rattling Ford Model A engine. When he looked up in the sky he saw a small aircraft, cruising above the thin layer of mist rising over the forest. He was not able to identify the aircraft because it was too far away. The time was 6:24am. Soon afterwards Gardner reported by radio to his HQ at Gold Beach, less than 50 km north of Brookings, that he had spotted an unidentified aircraft. About midday Gardner noticed a trail of white smoke over the forest to the south-east and he reported this at 12:24 to the HQ at Gold Beach, who ordered him to get close to the suspected fire.

Warrant Officer Nobuo Fujita, the only enemy pilot to drop bombs on the American continent. He did it flying from the submarine I-25.

Following careful observation of the Wheeler Ridge area Keith Johnson spotted a trail of smoke, extending in the east-to-west direction between Mount and Bear Wallow. Johnson, too, was told to get close to the area threatened with fire, where he was going to meet Gardner. Soon both of them discovered a burnt-out area some 18 metres in diameter with a small crater in the middle. At 4:20pm Johnson notified the HQ about his discovery, and he and Gardner collected pieces of metal and debris scattered near the fire.

Johnson remained on site during the night, and the following day he was joined by other forest rangers. Together they collected over 30 kg of various bomb fragments, which they identified as Japanese, having found Japanese markings on some



Japanese bomb attack area map. (Drawing Z. Szeremeta)

fragments. All the pieces found were taken to Brookings, then transported to Gold Beach, where they were turned over to the army and the FBI. The army had earlier been warned about a possible bomber attack, when on 9th September a soldier returning from his service at the post reported that he has seen an unidentified aircraft, which flew from the direction of the sea at 6:00am, and that he heard it again at 6:30am, flying in the opposite direction. Army officers and FBI agents were sure that the bombs dropped by the Japanese could have caused dangerous fires, had the forests not been damp from rain the night before. Fortunately, the ban on publication of any information about atmospheric conditions along the West Coast prevented any serious results of the fire, as *I-25* had no weather reconnaissance capability.

The American administration tried to keep the 9th September bomber attack secret, but too many people knew about it, so this proved impossible. Notes in the press and information on the radio about the bombardment resulted in some consternation among the local population, while West Coast defence services increased their vigilance. A unit based near the coast in the state of Washington took delivery of four additional fighter aircraft. Beside that FBI agents started a fruitless search for the Japanese seaplane, as they assumed it might be hiding on one of numerous lakes in the northwest.

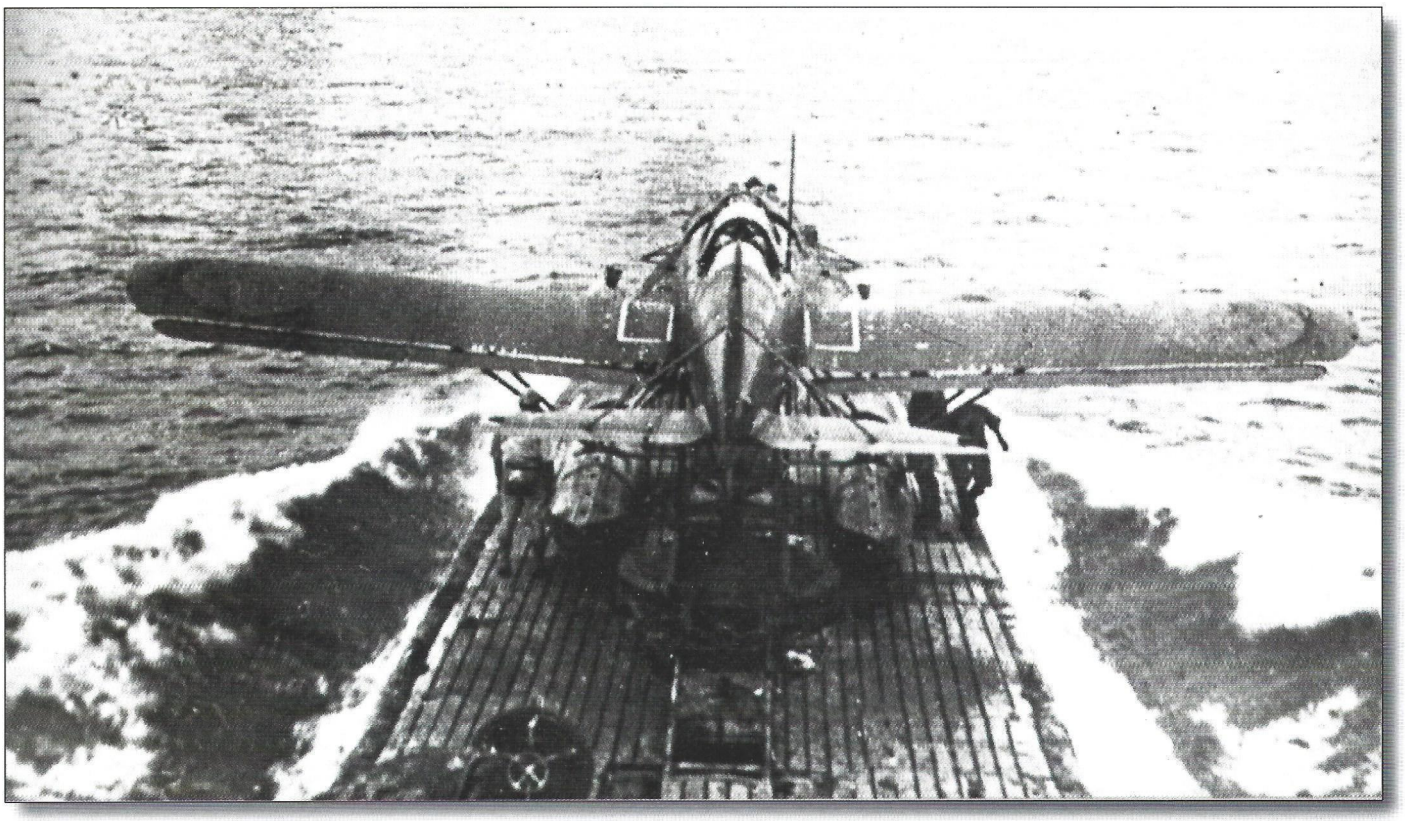
Having dropped his bombs, Fujita returned to the awaiting submarine. On the way back the airmen spotted two ships, which they passed in a wide circle to avoid detection. Upon alighting the seaplane was put into the deck hangar immediately, and the submarine prepared for a torpedo attack against the merchant ships.

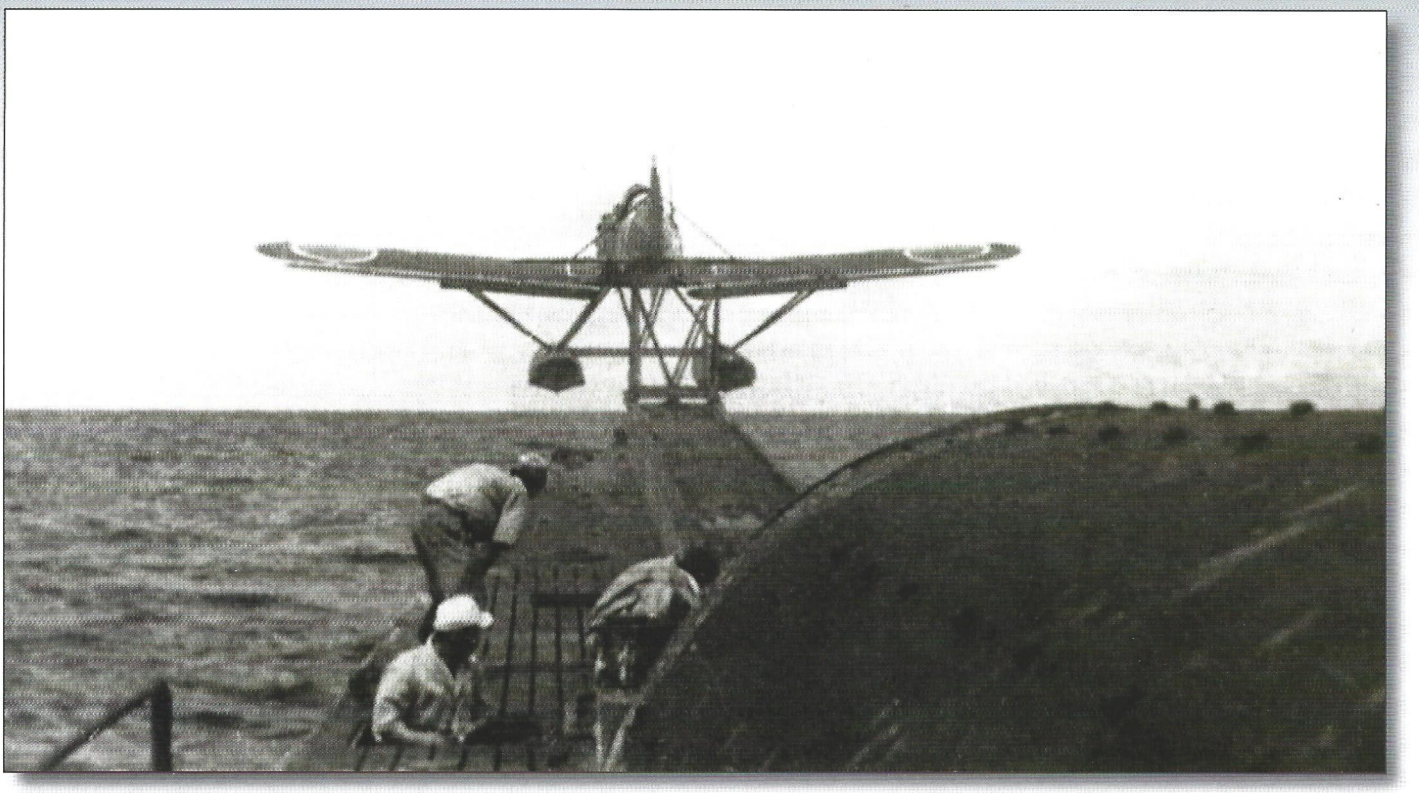
Upon return to the submarine *I-25* Fujita reported dropping two incendiary bombs that exploded in forested areas. It later transpired that only one of the bombs exploded and caused negligible damage in the Siskiyou National Forest, still wet from recent rain. Captain Meiji Tagami shared his enthusiasm and suggested that a subsequent attack should be carried out at night, since the Americans would await him at dawn.

A USAAF Lockheed A-29 Hudson patrol bomber based at McChord Field at Tacoma found the Japanese submarine. The submarine immediately dived to 70 m and waited safely at the bottom of the ocean west of Port Orford, throughout subsequent depth charge attack by the Hudson. The first depth charge exploded at 25 m and the next two at 30 m. The attack failed to inflict serious damage although some leaks, and electrical and radio system failures, forced the captain to be more careful. Therefore it was decided to perform the next operation at night.

Captain Tagami undertook another attempt to start a big fire in the Oregon forests. At 8:30pm on Tuesday 29th September, some 50 miles west of Cape Blanco, the Japanese submarine surfaced. Although the entire West Coast was covered in darkness, a lighthouse offered a reference point. Following take-off Fujita flew east for an hour and a half, after which he dropped his bombs and turned back. To avoid detection Fujita eased the throttle and glided back towards the coastline, to reach an altitude of 300 metres west of Cape Blanco. After momentary problems locating the *I-25*, Fujita came across a trace of an oil leak, which led him to the ship, and immediately upon

E14Y1 Model 11 being prepared for the take-off from I-29. *Note that the white outline of the Hinomarus have been overpainted in black.*





E14Y1 Model 11 seaplane takes off from the submarine I-29 *for a reconnaissance sortie. Soon afterwards the submarine would submerge. Note the large hinge of the hangar door.*

alighting he was hoisted onto the deck. Although in his report Fujita noted that he saw flashes of his bombs exploding and flames spreading around, no trace of the attack was found. The only record of this attack in the USA is a report that an unidentified aircraft was seen east of Port Orford.

At the time forest guards in Oregon prepared their Grassy Knob refuge located some 12 km east of Port Orford for winter. At 5:22am they reported to the HQ at Gold Beach that they had spotted an unidentified aircraft. Its engine sound was described as similar to the popular Ford Model A. At dawn on 29th September a fire-fighting patrol from Grassy Knob went to that area, but failed to find any trace of fire or bomb craters. The search continued for at least a week. None of the bombs dropped by Fujita was ever found.

Poor weather prevented another bomber attack using the two remaining thermal bombs. Captain Meiji Tagami cancelled the third mission, and decided to perform only patrol duties and hunt for transport ships. On Sunday 4th October, 50 miles west of Coos Bay in the south part of the Oregon coast, the submarine torpedoed the transport ship SS *Camden*, which sank on 10th October. The following Tuesday, this time off Cape Sebastian, she sank the tanker SS *Larry Doheny*. Two sailors and four gunners were killed.

A few days later *I-25* left the Oregon coastal waters. On 11th October 1942 *I-25* fired her last torpedo. On the return leg to Yokosuka she attacked and sank the Soviet submarine *L-16*, sailing in international waters from Dutch Harbor, Alaska, to San Francisco. The *I-25*'s captain thought that he had encountered an American submarine and that was why he attacked. At the time Japan and the Soviet Union were not at war. Following this action *I-25* returned to her home port at Yokosuka, and Warrant Officer Nobuo Fujita gained fame as a national hero. He became a flying instructor for Kamikaze units soon afterwards, and survived the war. Twenty years later he and his wife visited Brookings, Oregon, near where his bombs had fallen. Okuda, the observer, was killed in October 1944 off Formosa during attack against a US aircraft carrier. *I-25* was sunk off New Hebrides on 3rd September 1943 by the destroyer USS *Patterson* (DD-392).

No further attempt to bomb US territory from submarine-based seaplanes was undertaken. However, one more bombing attack is recorded: on 6th July 1943 the E14Y1 from *I-8* bombed Sumatra. No details are known, though.

After the war Nobuo Fujita established a company of his own and traded hardware with success. Student of forestry Johnson joined the US Navy, rising to the rank of Captain. During

a reunion on 24th January 1974 he met Fujita in Tokyo. The captain of the *I-25*, Captain Meiji Tagami, left the Imperial Japanese Navy as a Vice-Admiral.

What was the impact of the bomber attacks on Oregon, or were they just recorded as episodes in history when the USA was bombed from the air? For the Japanese they were a propaganda victory, a kind of revenge for Col. Jimmy Doolittle's Tokyo raid of 18th April 1942, reported on the front pages of principal Japanese newspapers, which in turn was a revenge for the Japanese attack on Pearl Harbor. From the military view point the results of the bomb attacks had virtually no significance, as the fires they started inflicted no losses. The local population was temporarily worried, but there was no panic that could spread along the entire West Coast. This was partly due to strict censorship of the press. The attacks were never repeated, as most of the submarines fitted to carry seaplanes were largely obsolete in design and many of these were gradually withdrawn from combat operations.

True flight route during first Fujita's bombing raid

Previously published text has been based on the memoirs of Nobuo Fujita cited in a number of books. The facts given below prove that Fujita's route during his first bombing raid differed slightly from the route he described.

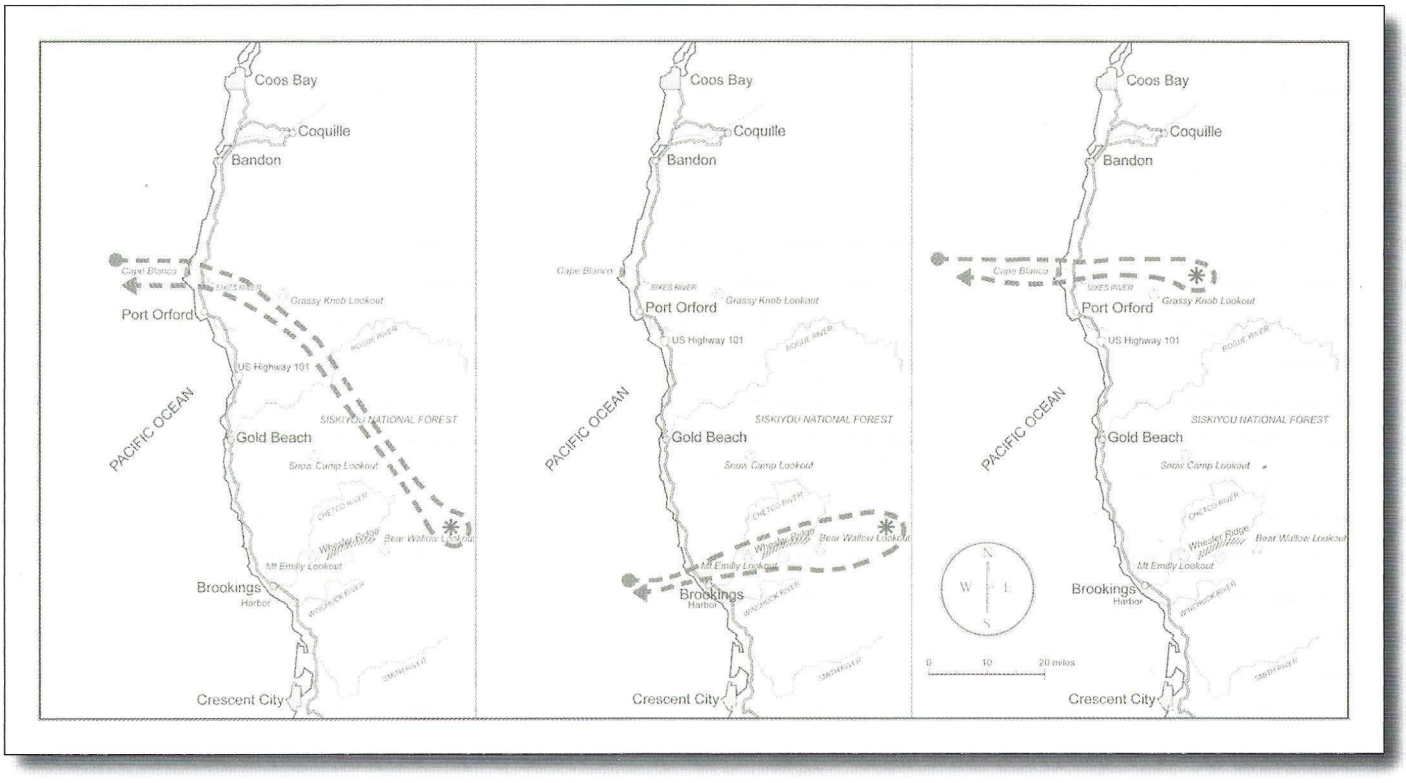
William McCash, the author of '*Bombs over Brookings*', interrogated witnesses of these events and published their memories in his book. He noticed that many people saw and heard the aircraft, which flew right over Brookings on 9th September 1942, i.e. on the day of Fujita's first raid.

Routes of Fujita's E14Y1 Model 11 during attacks on US territory.
***Left:** 9th September as reported byFujita.*
***Middle:** true route on 9th September.*
***Right:** second flight, on 29th September.*
(Drawing Z. Szeremeta)

The report on interrogation of Cmdr Meiji Tagami, the CO of *I-25*, who survived the war, contains information that Tagami showed the point on the map, where the seaplane took-off on 9th September 1942. The point was situated not near to Cape Blanco, as mentioned by Fujita, but near Brookings.

In 1956 one of crewmen of *I-25*, Sachi Okamura, published the book '*I-25 Go Shutsugeki su*', where he described exactly the circumstances of the take-off for first air raid, and stated:

- the *I-25* launched the E14Y1 flown by Nobuo Fujita 10 miles (18.5 km) offshore.
- the E14Y1 took-off at 10:00 (Tokyo time) on 9th September.
- the E14Y1 returned after the raid to *I-25* at 10:35. This means that Fujita's flight lasted only 35 minutes.



According to Fujita, his E14Y1 took-off from a point situated 38 km from Cape Blanco and bombed a target 80 km eastwards from Cape Blanco. The seaplane flew towards the target at 180 km/h, and returned to *I-25* at 240 km/h. Thus, the aircraft flew 27 minutes to the target and 20 minutes back to the submarine. According to Fujita the flight lasted 47 minutes.

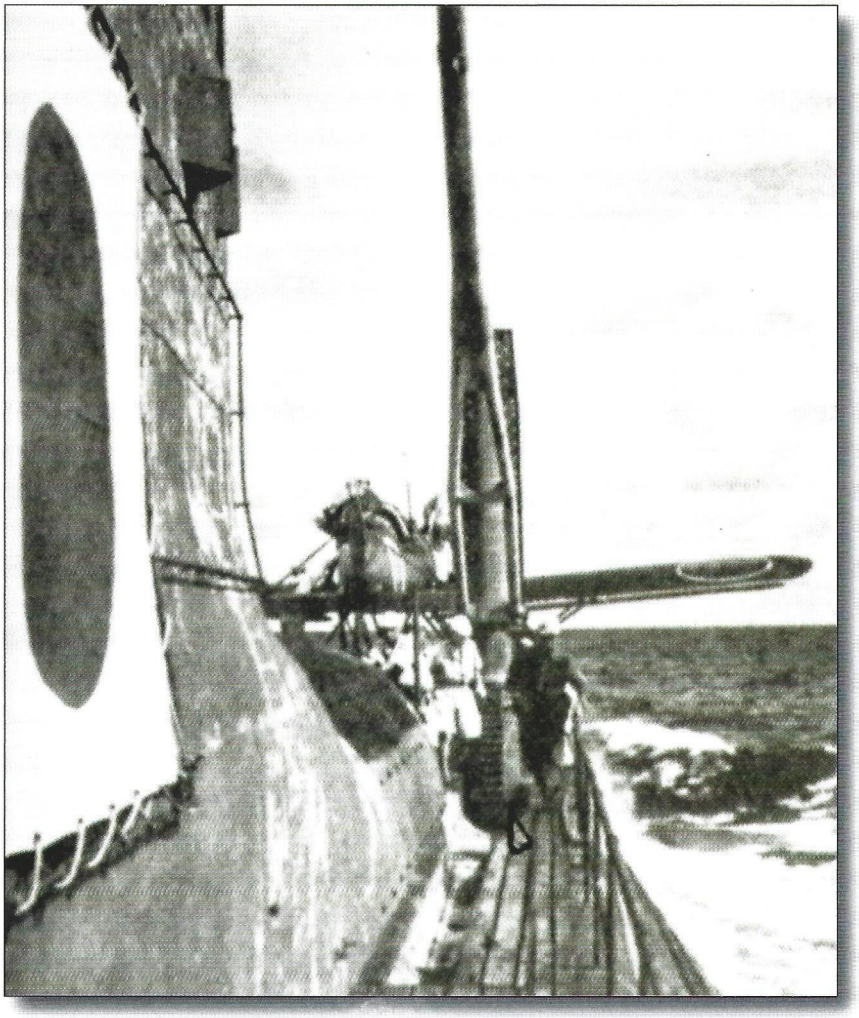
If Fujita took-off at 18.5 km from Brookings and flew over the town towards the target, then he covered a distance of 64 km from *I-25* and about 40 km back. If for calculations we take the flight speeds given by Fujita, then the flight towards the target took about 21 minutes, and the flight back only 10 minutes. Okamura mentioned that the first mission lasted 35 minutes, which seems to be more credible.

Taking into consideration the above-mentioned facts, the authors believe that during his first flight Fujita flew over Brookings, and not over Cape Blanco.

E14Y1 in take-off position on the catapult of a submarine. Note the folded crane that was used to hoist the seaplane from the water following a mission. The photo was taken in 1942, when only the flying deck and hangar were painted black, and the Hinomaru flag was laced to the rail on the conning tower. White Hinomaru *borders on the aircraft's wing have not been overpainted.*

Transport mission to Germany

After Japan's surprise attack on Pearl Harbor, Adolf Hitler declared war on the USA under the tri-partite alliance of Axis Powers of 27th September 1940. This alliance was going to be supported by a mutual exchange of strategic materials and products between Germany, Italy and Japan. Initially this role was performed by German surface ships, and their supply-carrying voyages were given the Japanese codename *Yanagi Yuso* (Willow Transport). As maritime operations were becoming dangerous for the Axis Powers, submarines were chosen as the best means of transport. To this end the German Navy HQ asked the Imperial Japanese Navy on 27th March 1942 to carry out offensive operations against allied convoys in the Indian Ocean, to relieve the *Kriegsmarine* this way. On 8th April the Japanese agreed to send several submarines towards the east coast of Africa to support the Germans. Soon afterwards the 8th Submarine Squadron was withdrawn from the 1st Division at Kwajalein on the Marshall Islands and despatched to Penang in Malaya.



Submarine *I-30* under Commander Shinobu Endo was one of the 8th Submarine Squadron ships detached by its commanding officer, Captain Noboru Ishizaki. This was a fast, 109-metre *Otsu 1-Go* class submarine. In the Squadron she cooperated with Ko class submarines, such as *I-10, I-16, I-18*, and *I-20*, and with other auxiliary ships. On 22nd April the *I-30* was send to Penang and later *I-30* patrolled the east coast of Madagascar, where she was one of the first to receive orders to take part in the mission to Germany. As the mission was given priority, Vice-Admiral Teruhisa Komatsu from the 6th Submarine Fleet took direct control over her.

On 2nd August *I-30* entered the Bay of Biscay. Once she passed Cape Ortegal in Spain, eight Junkers Ju-88A *Luftwaffe* bombers flew to meet her and give her protection from the air. Three days later she was joined by a flotilla of minesweepers and escorted by them to the port of Lorient, one of five large German submarine bases on the French coast. This was an historic moment, as the Japanese submarine *I-30* was the first to reach Europe. The importance of the

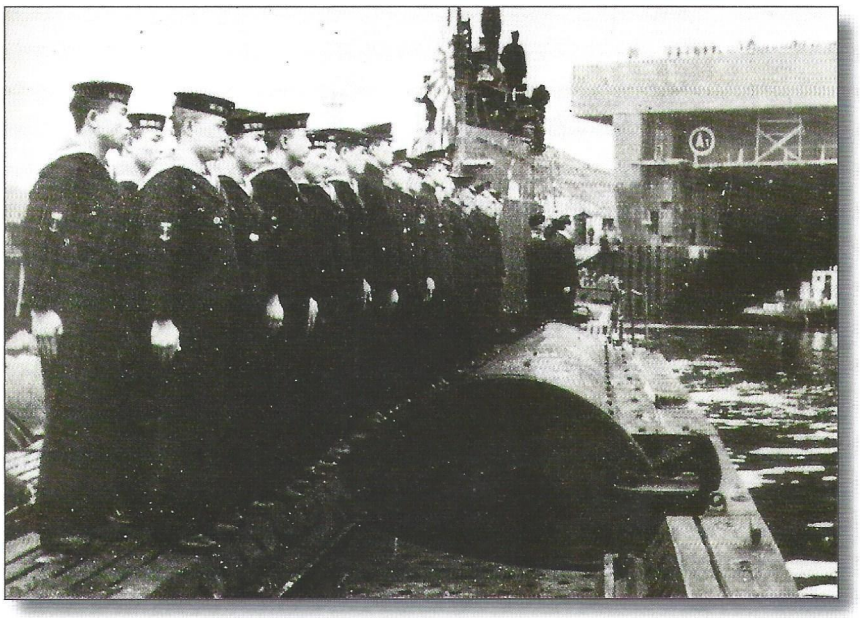
event is best shown by the fact that Admiral Erich Raeder, commanding the *Kriegsmarine*, Admiral Karl Dönitz commanding the German submarine force and Captain Tadao Yokoi, the Japanese Naval Attaché in Berlin, arrived to welcome Captain Shinobu Endo and his crew. The Lorient garrison band played war tunes and a young girl with a bunch of flowers welcomed Captain Shinobu Endo, wishing him much success on behalf of the German U-boat HQ. Following the welcoming ceremony 1,500 kg of mica and 660 kg of explosives, as well as design documentation of the Japanese Type 91 aerial torpedo, were unloaded from the Japanese ship.

Kriegsmarine submarine experts examined the design of the Japanese *I-30* and gave their opinion. First of all they considered that the sounds of the Japanese ship were much louder than acceptable by German standards. Therefore, they said, hydrophones installed in Allied destroyers could quickly locate the Japanese submarine, but even if they did not, Allied patrol aircraft fitted with radar systems would do so immediately. To prevent that, German experts fitted the Metox Biscay Kreuz passive radar detector on the bridge of the Japanese ship. They also removed the Type 96 25 mm anti-aircraft gun, replacing it with the quadruple Mauser 20 mm fast-firing cannon.

Also the E14Y1 carried by *I-30* was modified. First of all it was given fictitious unit markings. The Germans then shot propaganda film from firing trials of the seaplane, inventing a story of Imperial Japanese Navy air units now operating from French bases. Meanwhile Captain Shinobu Endo went to Berlin, where Adolf Hitler decorated him with the Iron Cross. On 22nd August the visit came to an end and *I-30* sailed home. It carried a complete *Würzburg* ground anti-aircraft radar with technical documentation and several torpedo, bomb and artillery guidance systems. It is probable that it also carried industrial synthetic diamonds worth approximately one million yen and about 50 ultra-secret Enigma ciphering machines.

A month later *I-30* navigated rounded the Cape of Good Hope and entered the Indian Ocean. In the early morning of 8th October the ship returned to Penang. Vice-Admiral Zenshiro Hoshima from the Navy Supply command collected ten Enigmas from Captain Shinobu Endo, and two days later the *I-30* sailed to Singapore through the Straits of Malakka. On the night of 13th October *I-30* came to the roadstead and in the morning it entered the port of Singapore. Vice-Admiral Denshichi Okawachi, commanding the 1st South Expeditionary Fleet, and the crew of the 10th Special Base Unit gave an enthusiastic welcome to Captain Shinobu Endo and his crew. The same day the submarine's navigation officer asked for a set of maps of waters surrounding Singapore with minefield locations. The following day the ship was going to sail for Kure. Some three miles from Keppel Harbour, however, *I-30* hit a mine. The explosion terminally damaged the submarine, although Captain Shinobu Endo and the crew were saved before the ship sank.

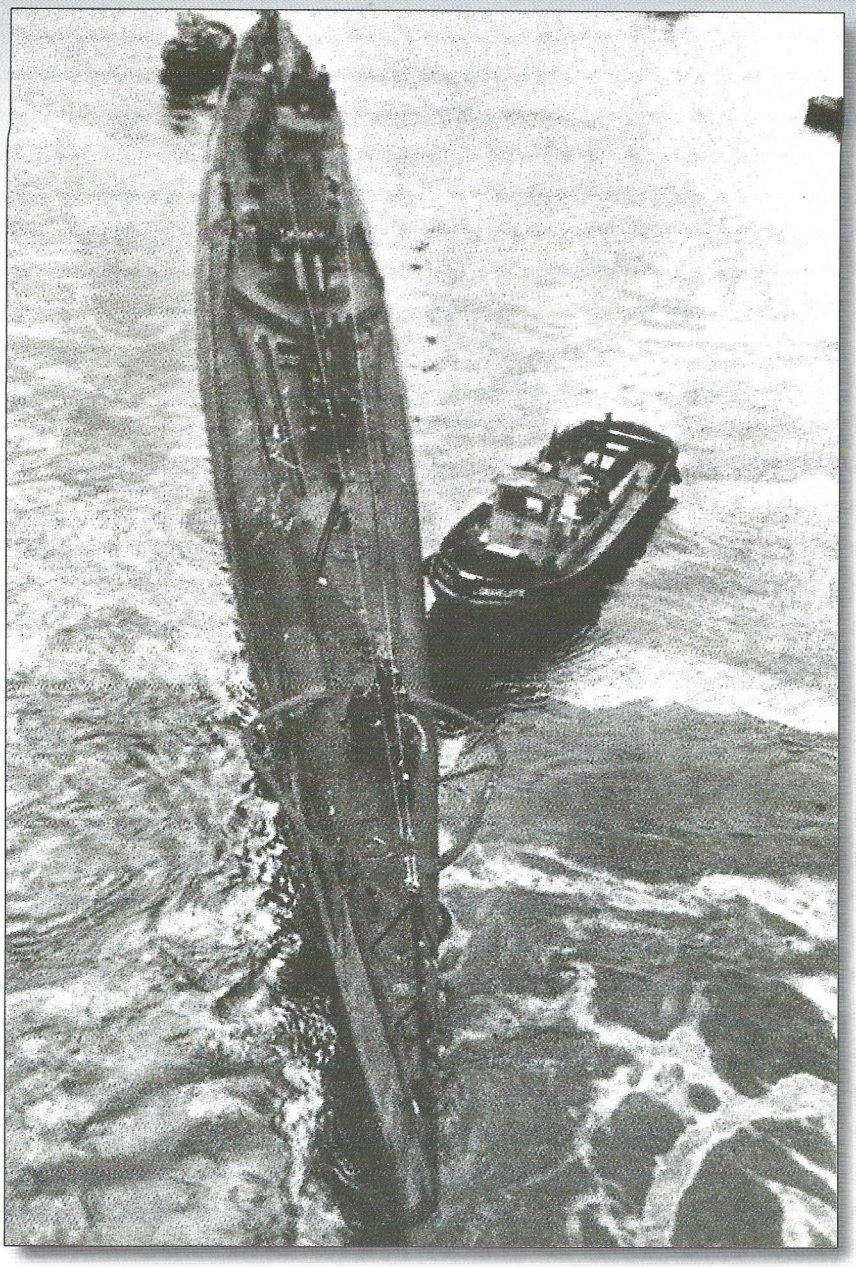
Crew of the Japanese submarine I-8 *being welcomed at Brest.*



A team of divers was sent immediately to the location in order to recover the cargo carried by the *I-30*. They found the *Würzburg* radar, but it was seriously damaged in the explosion, its technical documentation was also located, but it was useless due to exposure to sea water. The Enigma machines were lost, although the Japanese only admitted that to the Germans after four months. Although *I-30*'s trip ended in an unexpected failure, both the Germans and the Japanese assessed the mission favourably. On 31st March 1943 the Japanese ambassador in Germany, Hiroshi Oshima, signalled Tokyo that Feldmarschal Erich von Manstein suggested, due to the tight Allied sea blockade, a conversion of older German submarines for the transport role to carry strategic cargo between Europe and the Far East. Ambassador Hiroshi Oshima pledged to obtain a positive response

to von Manstein's concept in the shortest possible time. The signal from Ambassador Hiroshi Oshima was ciphered using the 'purple' diplomatic code, but it was intercepted and decoded by Allied intelligence services.

On 1st June the submarines *I-8* and *I-10* and the special submarine tender Hie Maru left Kure. Captain Shinji Uchino, the captain of the *I-8*, was ordered to go to Lorient. This mission was given the code name Flider in German, meaning "Lilac". So the Japanese code name should be Fuji. The *I-8* was a *Jun Sen Type J-3* class submarine. It carried a special cargo of two Type 95 torpedoes with oxygen propulsion, technical documentation for the guidance system, Type 95 tubular torpedo launchers and an E14Y1. Captain Shinji Uchino was accompanied by Lt. Commander Sadatoshi Norita and a crew of 48. Norita was going to be trained by the Germans in the Baltic and take command of the *U-224*, a Type-IXC/40 class submarine. Other passengers included four interpreters and cryptographers, as well as a military surgeon and a torpedo boat engine specialist. Nine days later Captain Shinji Uchino arrived at Singapore, where he collected additional cargo of quinine, tin, and gum, and he sailed for Penang. On 21st July the *I-8* entered the Atlantic, where it was thrown about by storms for the first ten days.



Submarine I-8 on the roadstead off Brest.

On 24th July the tired Japanese sailors received the first radio signal from the Germans, warning them about radar-equipped patrol aircraft. Facing increased patrol activity, five days later Captain Uchino received another radio signal from the Germans, telling him to go to Brest rather than Lorient. *I-8* crossed the equator on 2nd August, and on 20th August the Japanese met *U-161* commanded by Lieutenant Albrecht Achilles. The next day the *I-8* took Lt. Jahn and two radio-operator petty officers on board. The Germans fitted a FuMB 1 Metox 600A radar detector on the bridge of the Japanese ship. On 29th August Commander Shinji Uchino entered the Bay of Biscay and the *Luftwaffe* sent Ju 88s to escort him. Two days later the Japanese submarine arrived safely at Brest. After the Japanese ship anchored, a German press agency issued a communiqué that "*even Japanese submarines operate freely in the Atlantic now*".

I-8 stayed at Brest, before leaving on 5th October. Her cargo included machine guns, bomb sights, Daimler Benz engines for torpedo boats, naval chronometers, radars, sonars with auxiliary equipment, anti-aircraft sights, electrically-propelled torpedoes and penicillin. Moreover, Captain Shinji Uchino this time welcomed Rear-Admiral Tadao Yokoi, since September 1940 the Naval Attaché in Berlin and Captain Sukeyoshi Hosoya, since December 1939 the Naval Attaché in France. *I-8* also carried three German officers from the *Kriegsmarine*, a German Army officer, and four technicians to service the radar and hydrophones.

After crossing the equator Captain Uchino signalled Germany with his position, and the signal was immediately intercepted by Allied intelligence services. The following day the *I-8* was attacked

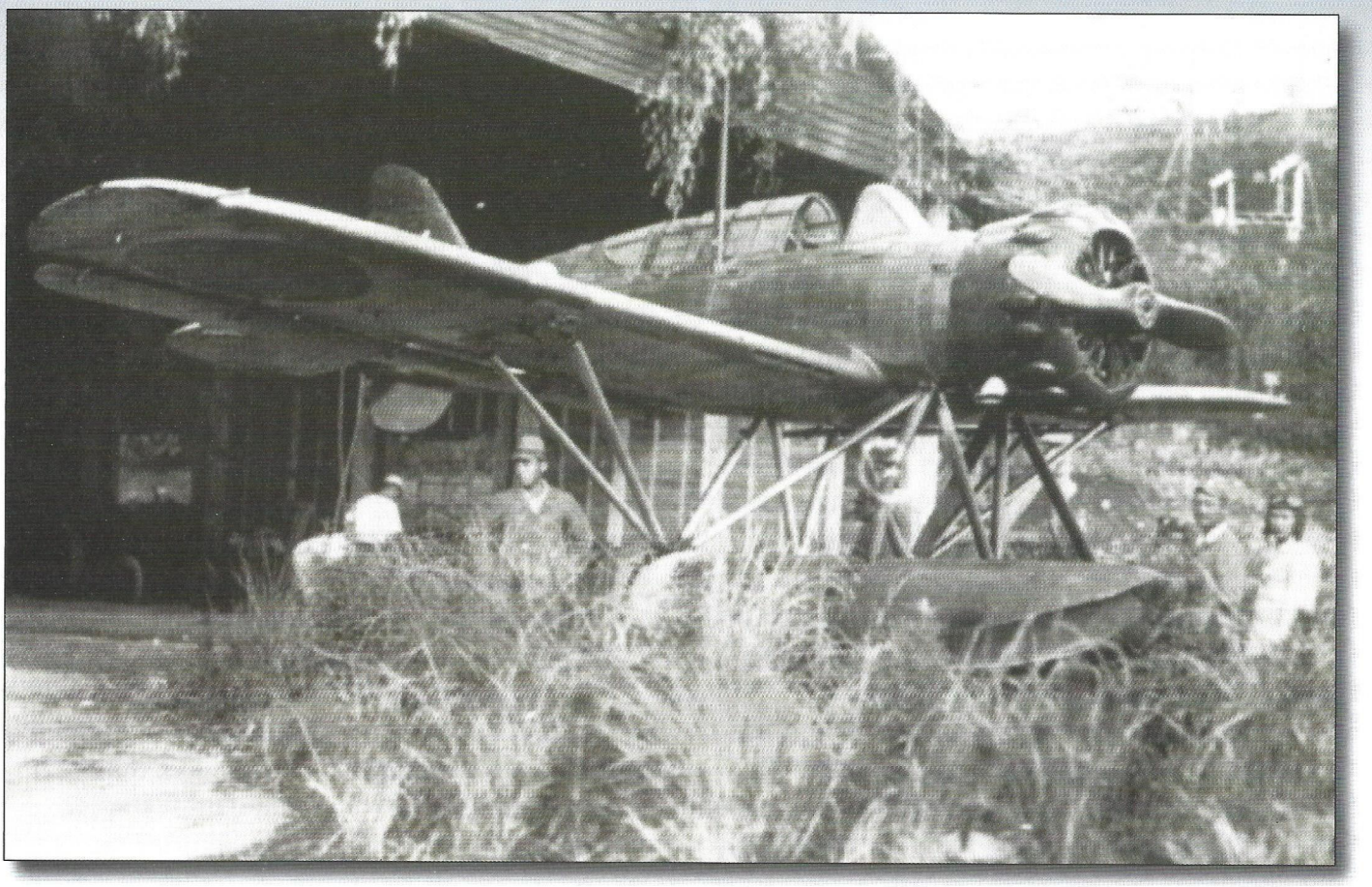
by anti-submarine aircraft and the Japanese had to save themselves by a crash dive and an underwater escape. On 13th December 1943 *I-8* reported from near Cape Town in South Africa. That same day *I-34* commenced its mission to France, but she was soon detected and torpedoed south of Penang by the British submarine HMS *Taurus*. This was in fact the first Japanese submarine sunk by a British one. This meant that there was now a threat of Japanese submarines being intercepted by Allied ones, so Captain Uchino received orders to proceed straight to Singapore, where he arrived on 5th December.

Captain Shinji Uchino anchored near *I-29* commanded by Captain Takakazu Kinashi, who arrived from Kure at the same time and was soon going to France. Both commanders met to compare notes. Among other notes, Captain Shinji Uchino warned his colleague about Allied patrol aircraft equipped with radar he had encountered. He gave his favourable opinion about the the Metox radar detector which he had received from *U-161*. Following a short rest at Singapore the *I-8* proceeded and eventually on 21st December it moored at Kure, having covered 30,000 nautical miles. Captain Shinji Uchino went to Tokyo, where made his report to Admiral Osami Nagano, Chief of the General Staff of the Imperial Japanese Navy and Admiral Shigetaro Shimada, the Navy Minister.

Epilogue

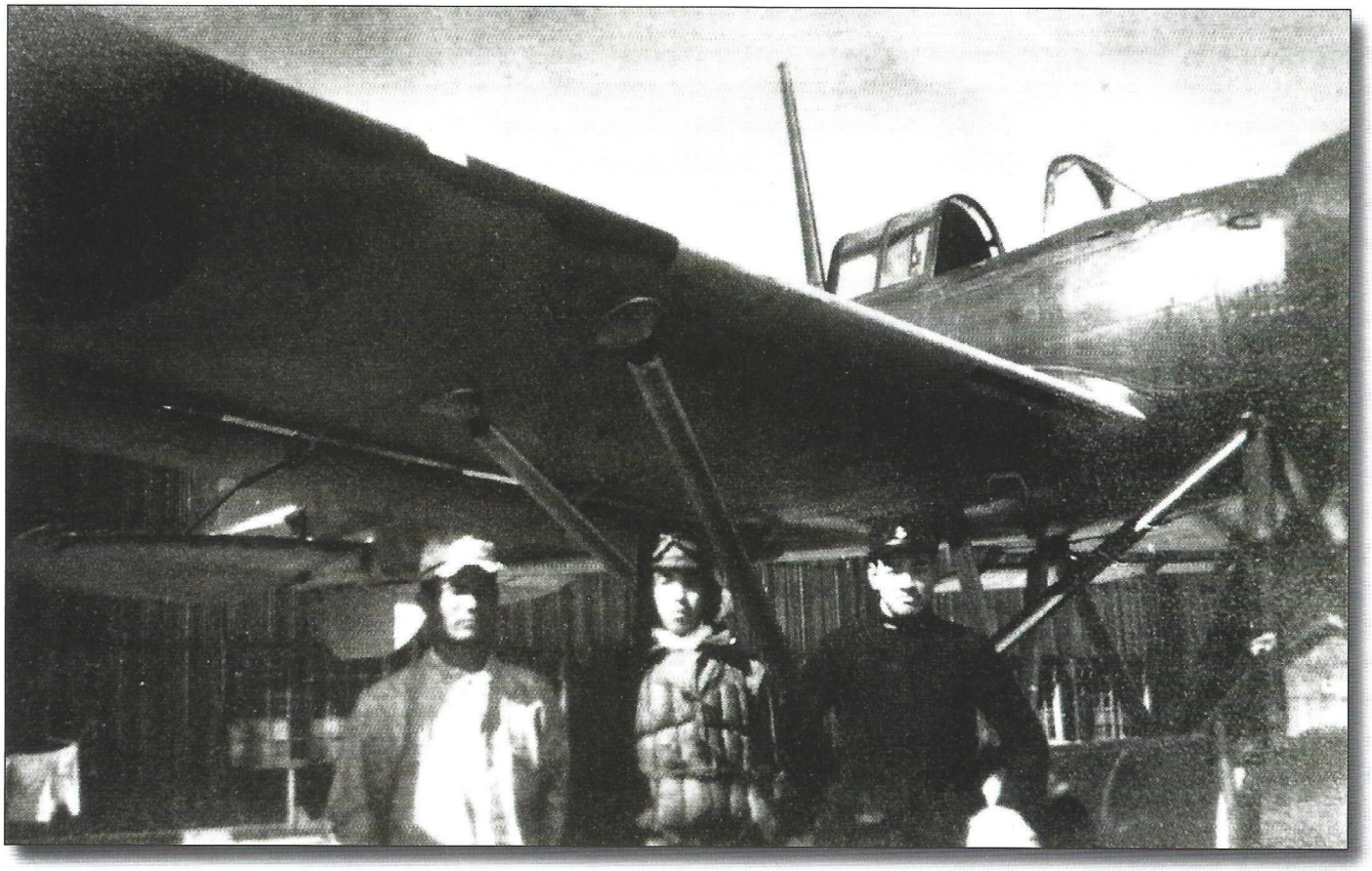
The E14Y1 equipped, first of all, the large ocean-going Ko and Otsu class submarines, but on a reduced scale they were also used by transport ships. Since they needed virtually zero-wind conditions to take off and perform their duties successfully, they were rarely used operationally. After 1943 reconnaissance operations of the E14Y1 were discontinued, as they failed to bring concrete results. Moreover, faced with mounting enemy resistance, the submarines were not able to stay on the surface long enough for the take-off preparations and then for landing of the seaplane. That same year series production of the aircraft was terminated after 138 were built. The seaplanes were also used on transport submarines, although not as actively, because take-off required rather calm seas. Several E14Y1s were also used by the Germans in their submarine base on Sumatra.

Although the E14Y1 was planned as equipment of submarines for reconnaissance duties, it was also used for patrolling the home waters of Japan. The seaplanes performed a number of reconnaissance missions. On 12th June 1944 the E14Y1 from *I-10* flew over Majero. This was the last reconnaissance sortie of any E14Y1. Only seventeen E14Y1s survived until the end of the war.



Above: *E14Y1 Model 11 undergoing overhaul at the base in Kure. Cowling is painted black.*

Below: *E14Y1 Model 11 at Kure. Note the yellow bands on the leading edge of the wings, and that the upper Dark Green wraps around the leading edges of the wing and also of the tailplane.*



Markings on submarine-based seaplanes

From 1932, when E6Y1 reconnaissance seaplanes and E9W1 small reconnaissance seaplanes entered service on submarines, larger reconnaissance seaplanes were allocated to almost every battleship or cruiser. The individual marking on a seaplane based on a submarine consisted of the 'SU' symbol of the Japanese katakana alphabet plus a digit to identify the submarine. For example, a seaplane from the *I-5* was marked 'SU-5', where the 'SU' was written in the Japanese katakana alphabet.

In 1939 a new system of identification markings was introduced, consisting of a combination of a katakana character and a Roman numeral. According to the identification regulations for aircraft of the *Rengo Kantai* (Combined Fleet) of 15th November 1940, the listing of code letters for seaplanes of the first unit of submarines started with 'SI', for the second unit of submarines with 'T', and for the third unit of submarines belonging to the 6th *Kantai* (6th Submarine Fleet) started with 'U'. The seaplane number was applied in form of a digit in blue.

From 14th July 1942, following the defeat at Midway, the HQ of the *Rengo Kantai* changed its organisation system. It was decided that only 14 out of 19 submarines would carry reconnaissance seaplanes. The seaplanes would now have the same identification codes as at the beginning of the war.

Code markings of the *Dai 6 Kokutai* (6th Submarne Fleet) were as follows:

Light cruiser *Katori* (the flagship of the Dai 6 Kantai)	– S
Dai 1 Sensui Sentai (1st Submarine Squadron)	– S I
Dai 2 Sensui Sentai (2nd Submarine Squadron)	– S II
Dai 3 Sensui Sentai (3rd Submarine Squadron)	– S III
Dai 8 Sensui Sentai (8th Submarine Squadron)	– S VIII

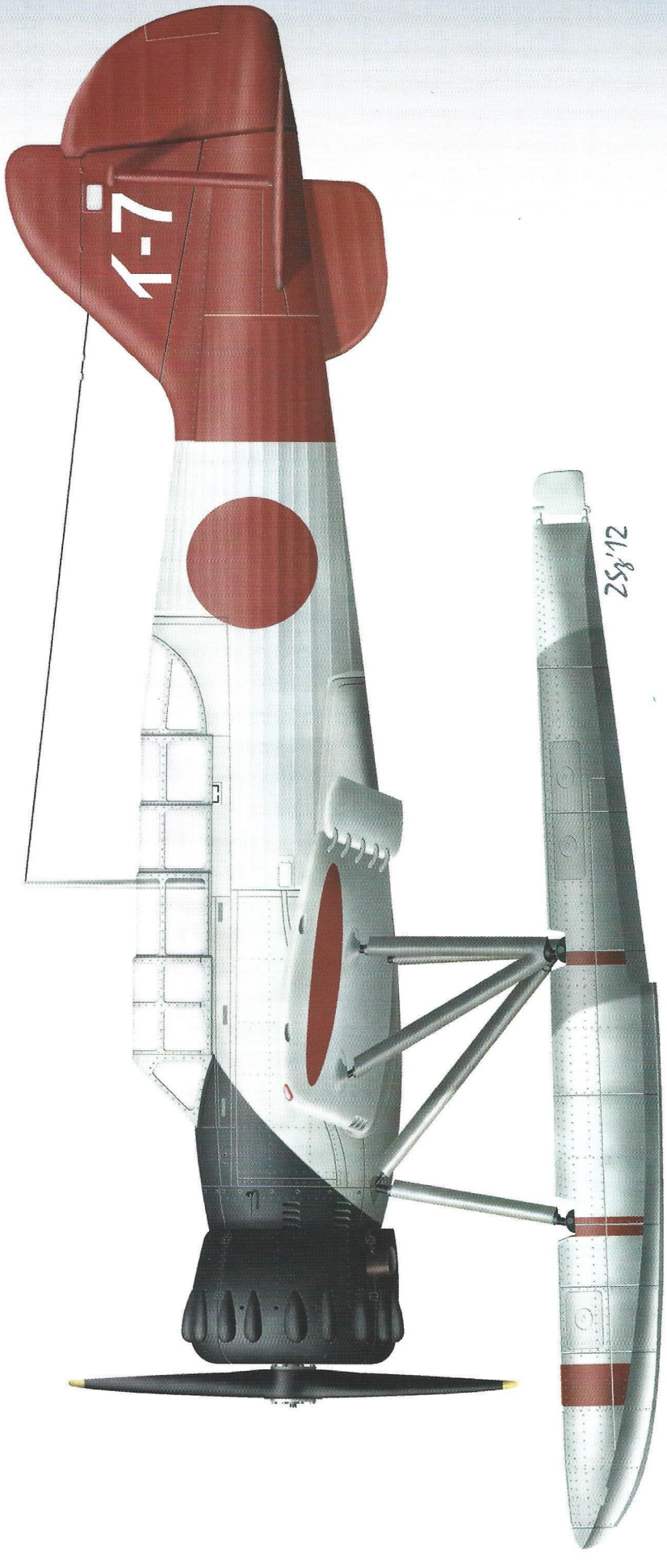
Markings were blue with white outline.

When the organisation change was introduced, E9W1s were still in service. It was after the change that E14Y1s started to be delivered to submarines. From then on all seaplanes carried on submarines belonged to a reconnaissance unit within the 6th Submarine Fleet. The seaplanes were carried as needed by individual submarines.

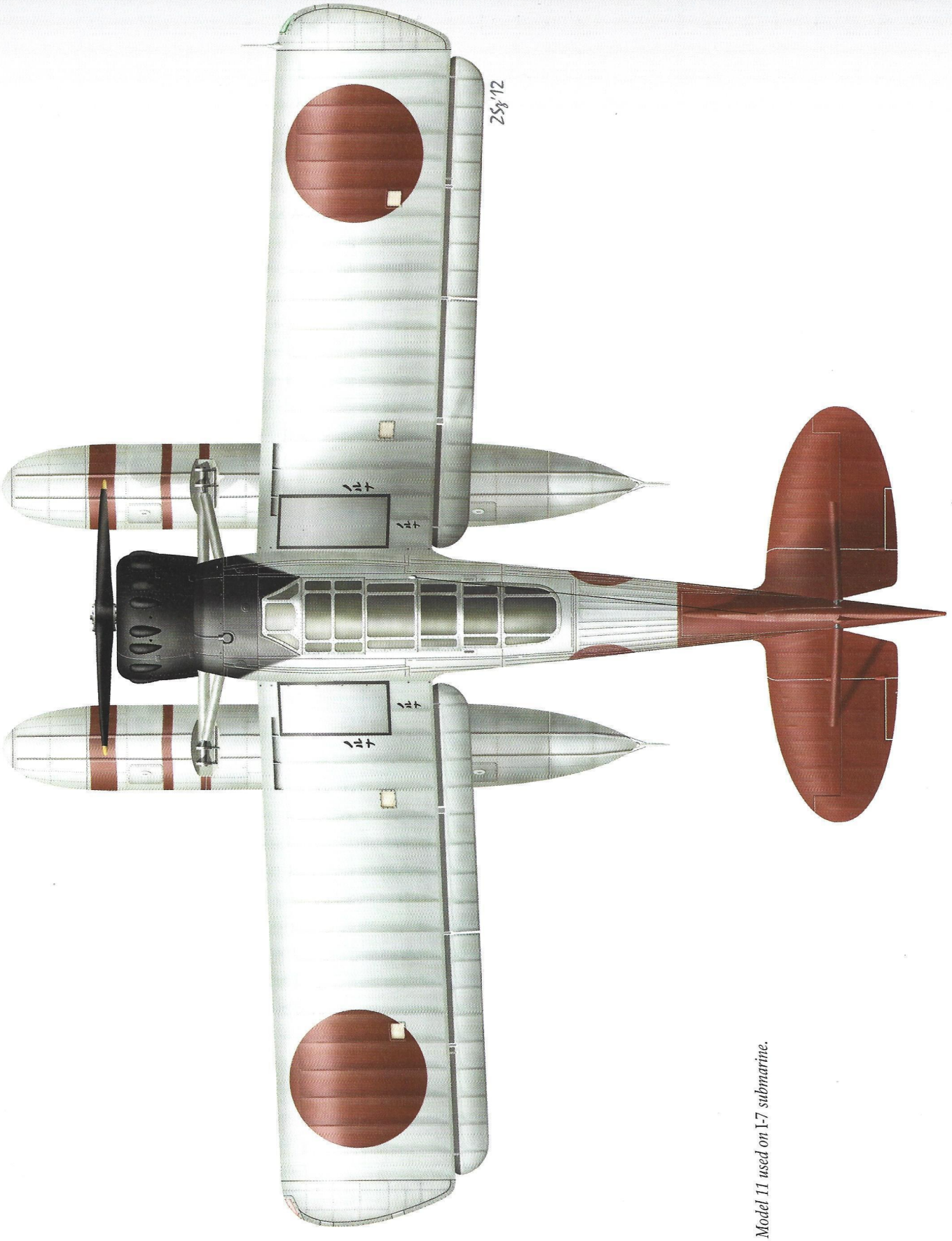
Seaplane identification markings were not linked with the submarine, but with allocation to the reconnaissance unit within the 6th Submarine Fleet. According to the identification regulations for aircraft of the *Rengo Kantai* of 1st August 1944, the unit was assigned the code '671'.

Camouflage and markings of seaplanes E14Y1

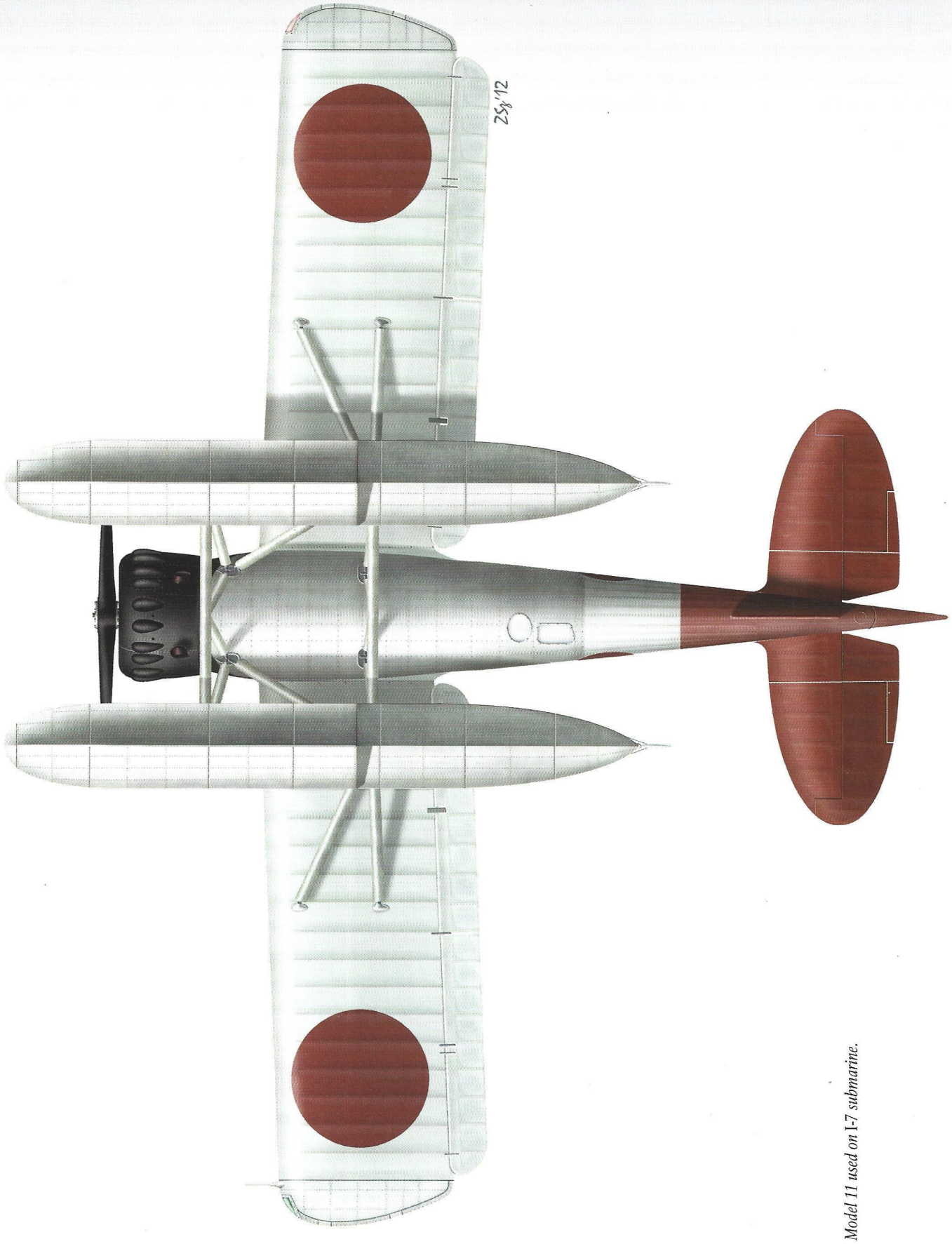
Prototypes of the E14Y1 were painted silver on all surfaces with a black engine cowling. The wing tips were painted red. On the floats was a wide red airscrew warning stripe. Narrow red stripes were painted at dolly positioning points on the floats. *Hinomarus* without white outline were painted on the fuselage sides just aft of the observer's cockpit and probably on lower wing surfaces (no *Hinomaru* on upper wing surface). The struts were painted black.



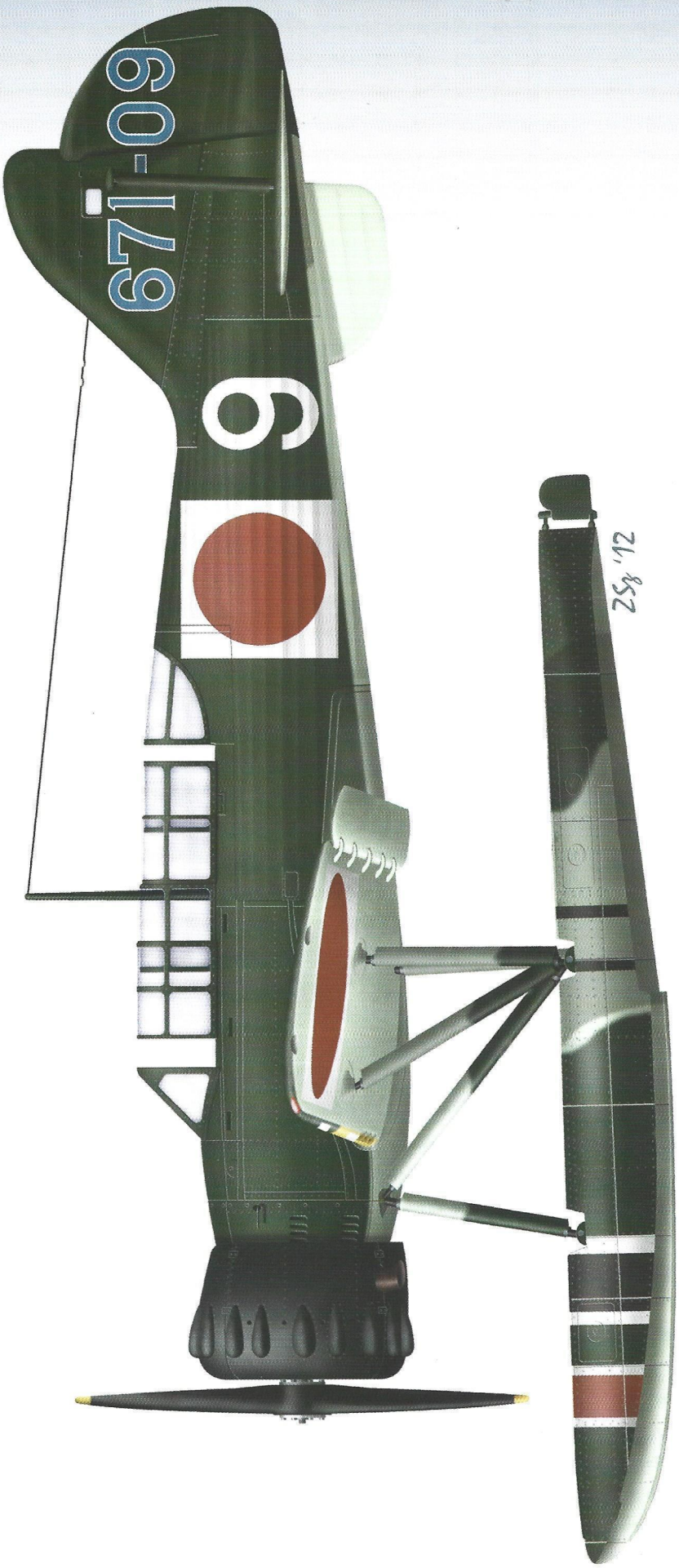
E14Y1 Model 11 used on I-7 *submarine. Aircraft silver overall with red tail and black nose.* Hinomaru *in six positions.*



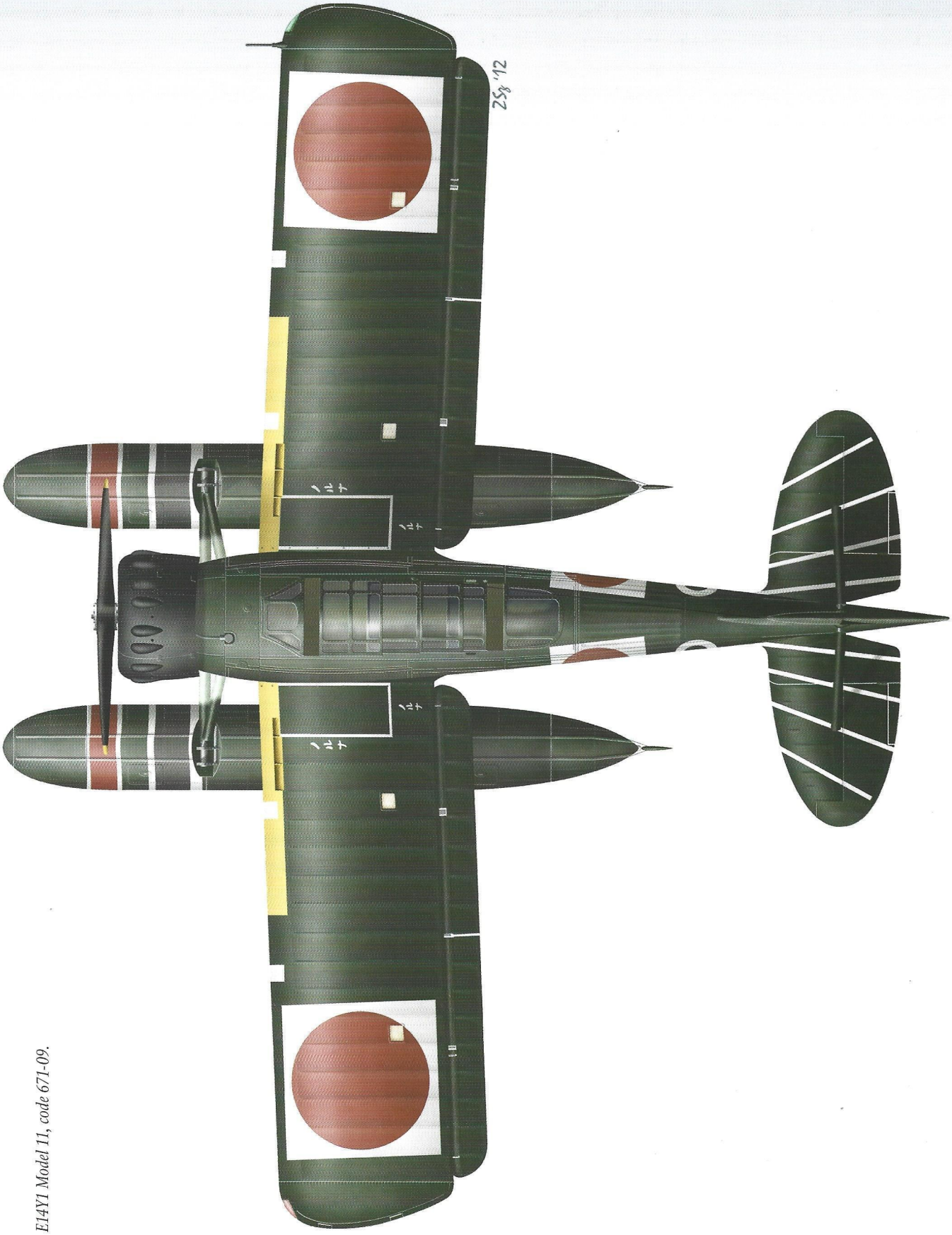
E14Y1 Model 11 used on I-7 submarine.



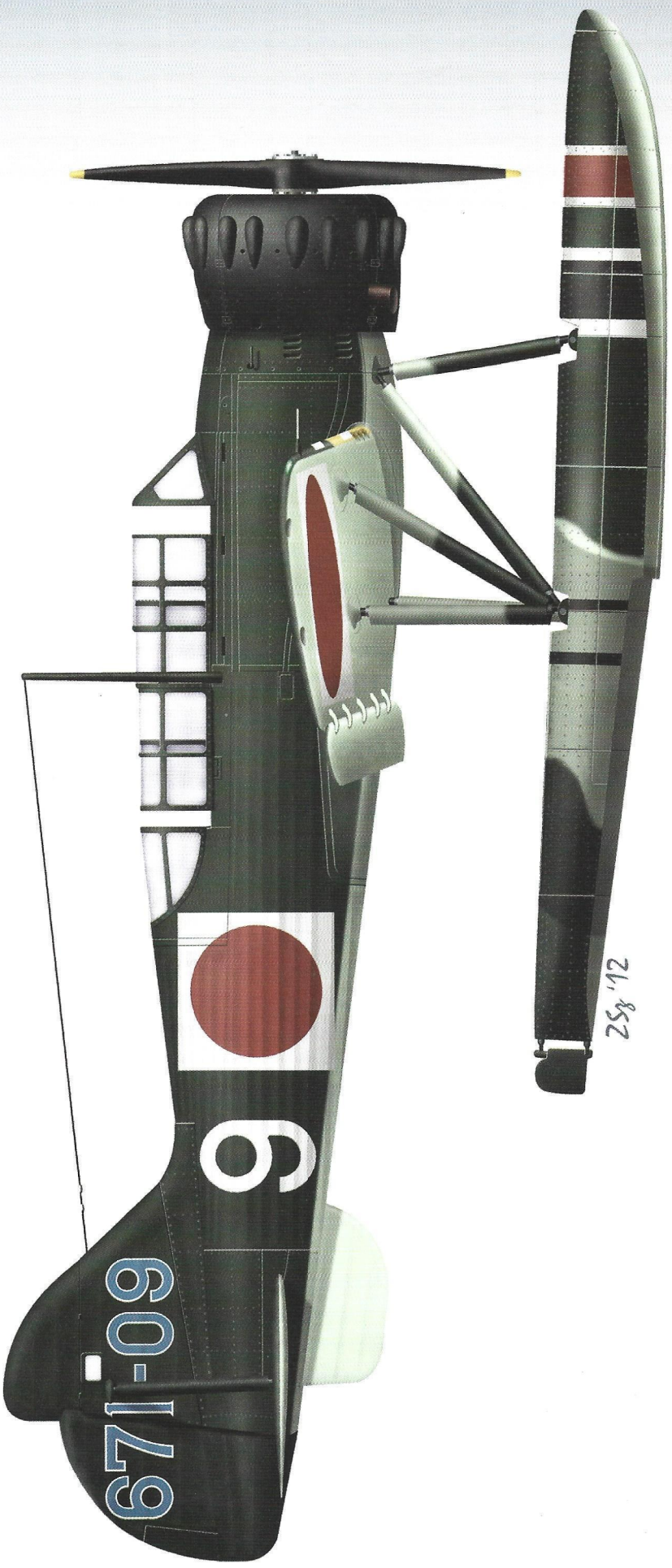
E14Y1 Model 11 used on I-7 submarine.



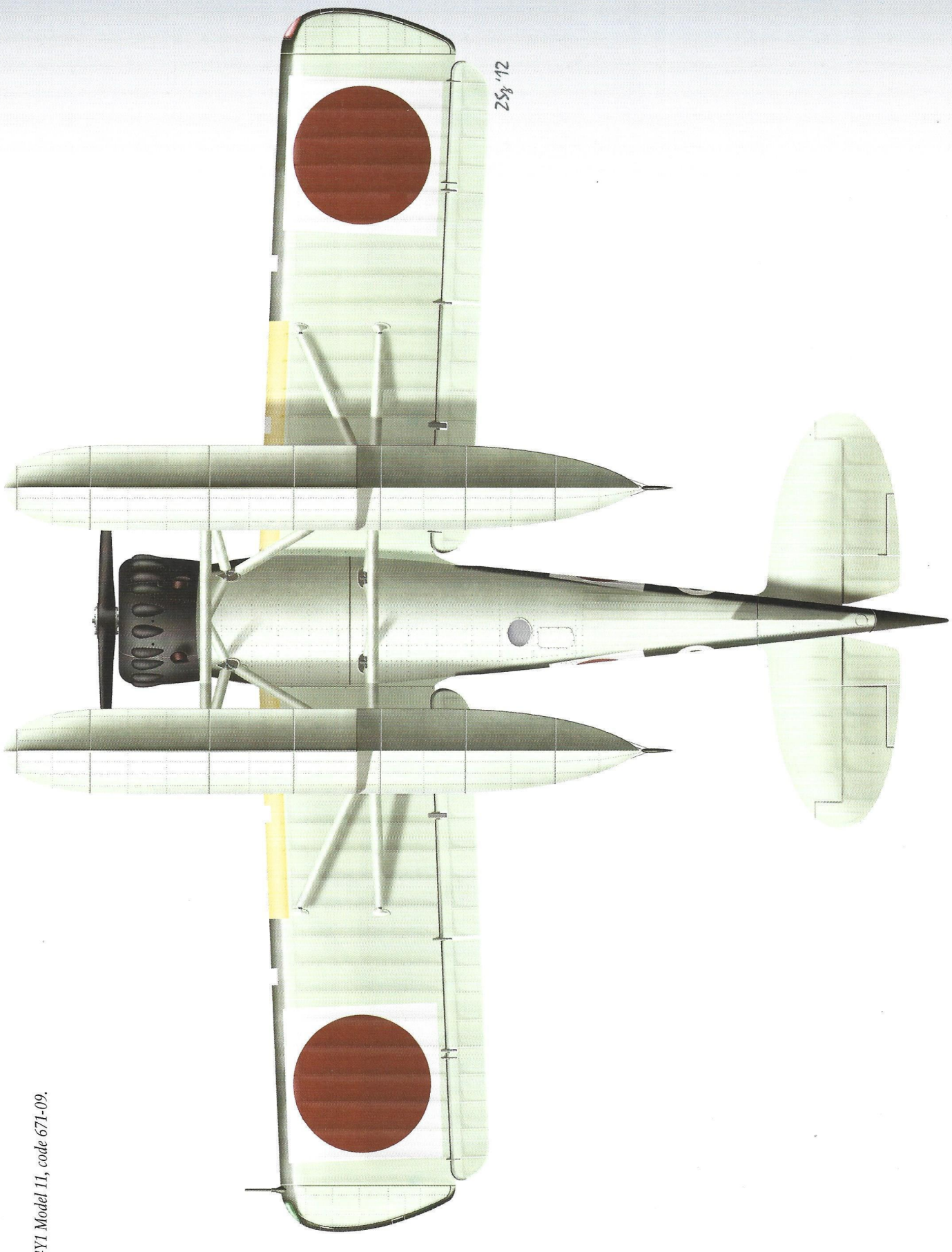
This and opposite page: E14Y1 671-09 with square type national marking.



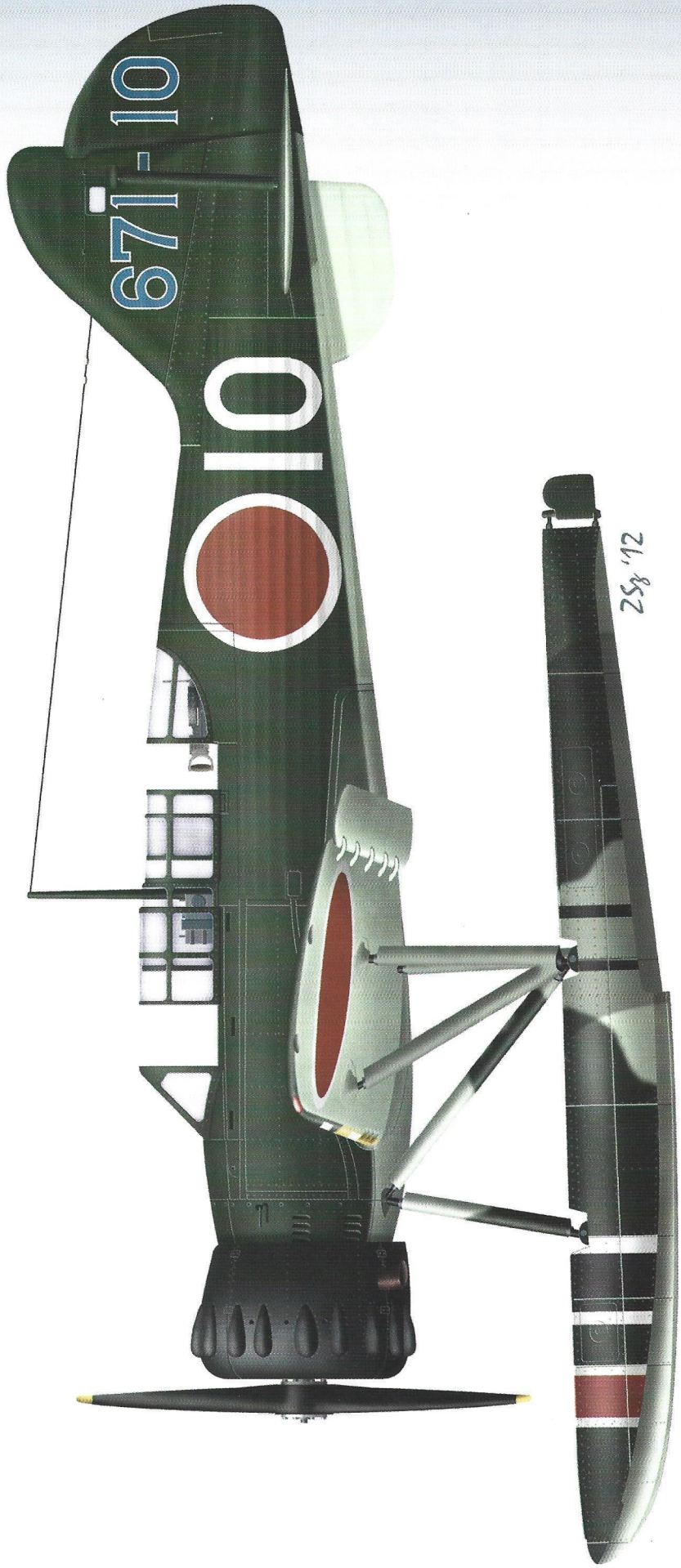
E14Y1 Model 11, code 671-09.



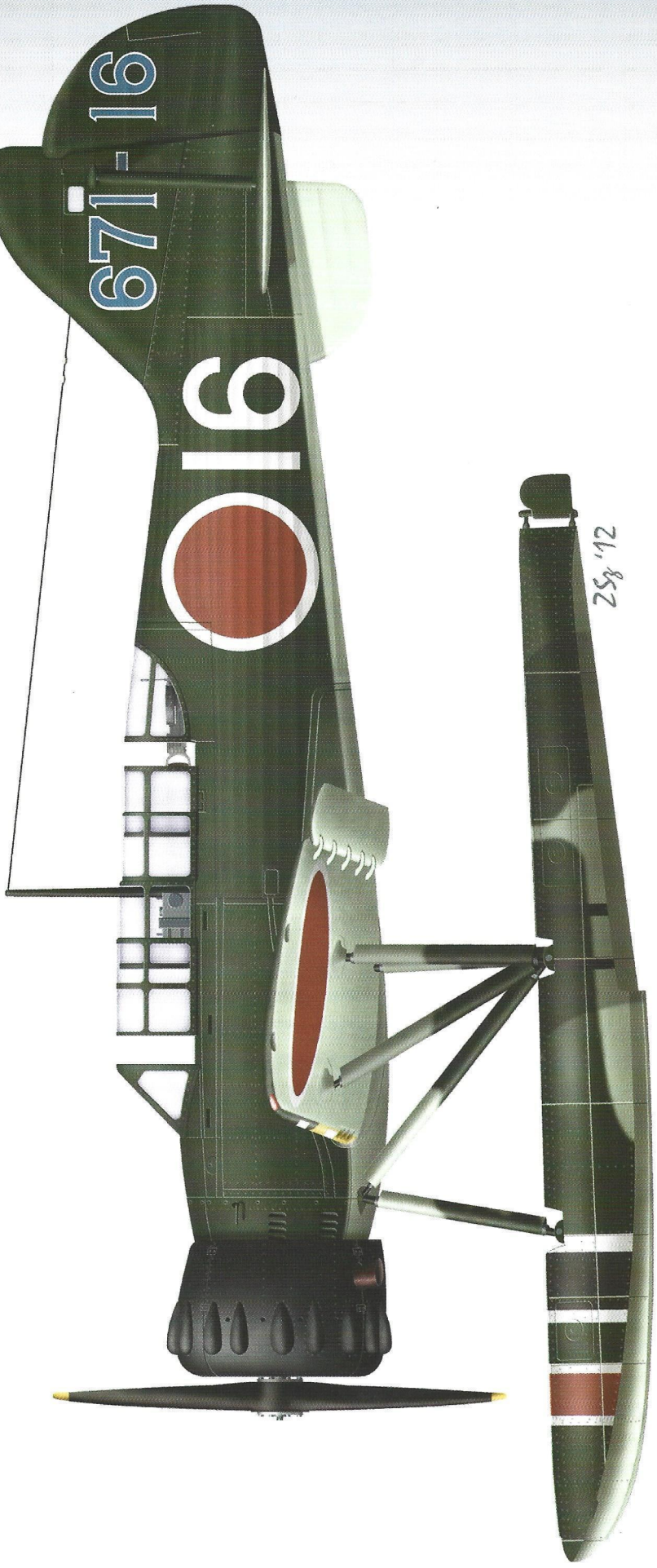
This and opposite page: E14Y1 671-09 with square type national marking.



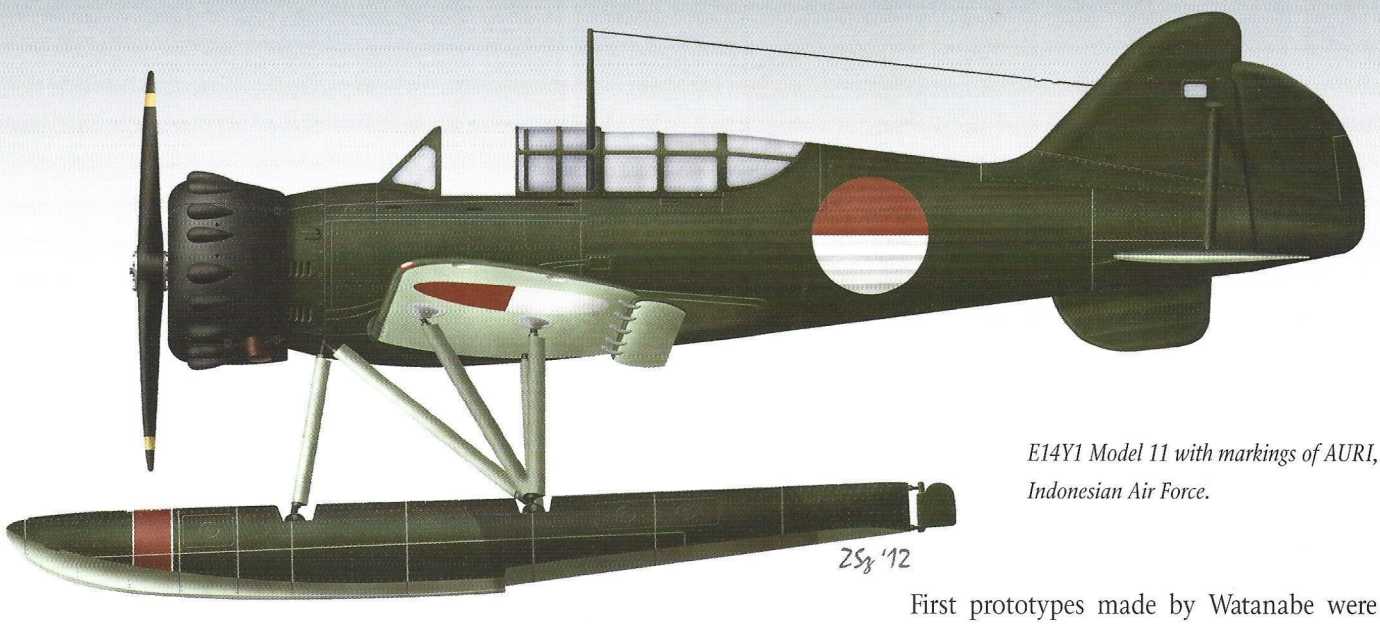
E14Y1 Model 11, code 671-09.



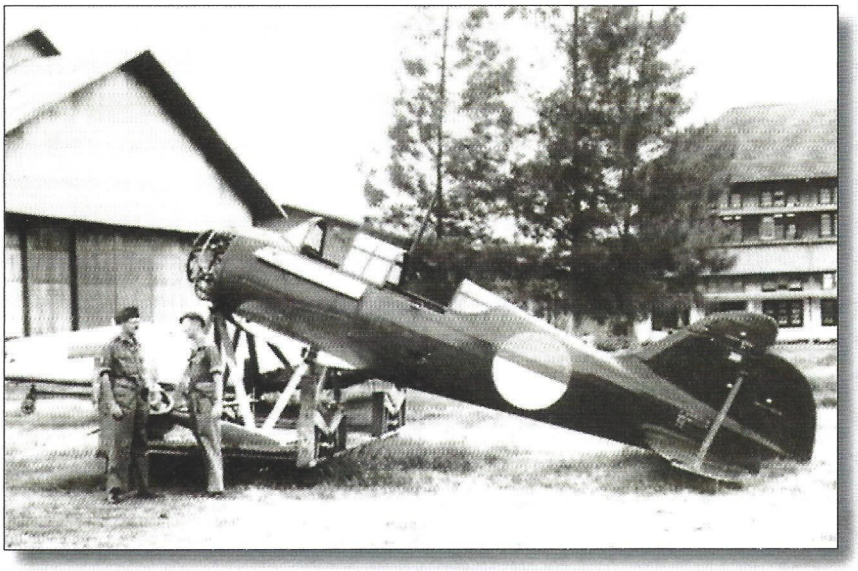
E14Y1 671-10, the 6th Fleet at Kure naval air base.



E14Y1 671-10, the 6th Fleet at Kure naval air base..



E14Y1 Model 11 with markings of AURI, Indonesian Air Force.



Fuselage of the sole Glen used by AURI (Indonesian Air Force). Aircraft was probably transferred from Penang to Jakarta later in December 1944, together with two Ar196s. *(see also page 64.)*

First prototypes made by Watanabe were probably painted (orange-) yellow, resulting from the agreement between the HQs of the IJN and IJA concerning camouflage of warplanes; according to the agreement trainers and prototypes were to be painted yellow. One of prototypes of the E14Y1 wearing identification markings KO-W22 is shown on the photograph, page 37. The marking 'KO' is an abbreviation of '*KO-ku gijyutsusho*' (Aviation Arsenal, in short Kugisho), because the seaplane was tested at Kugisho. The second letter 'W' defined the manufacturer, i.e. Watanabe Tekkosho. Last two digits denoted the seaplane serial number; the first digit was the prototype number (we assume), the second was the subsequent a/c number. Thus, the identification marking 'KO-W22' means that the aircraft is the second example of the second prototype seaplane built by Watanabe Tekkosho, and tested at the Kugisho arsenal. We assume that there were three prototypes: the first prototype with small vertical fin by Kugisho, the second prototype with enlarged vertical fin by Watanabe, and the third pre-production type with different engine cowling and large vertical fin by Watanabe.

KO-W22 was painted overall yellow with black engine cowling and black painted upper fuselage anti-glare panel. Hinomarus were painted with white outline on fuselage sides and upper/lower surface of the wing. On the float, a wide red stripe with white outline and four thin black stripes was painted. The first two float struts at least seem to be painted yellow.

Pre-production E14Y1 (a/c number 34 made in 1941, or No. 4 a/c of the third prototype), photos of which are in the manual, was painted silver on all surfaces with a black engine cowling. The struts were also painted silver. Hinomaru without outline were painted on fuselage sides and above and below the wing. The floats had a wide red stripe and four thin red stripes.

According to the *Kaigun Koku Hombu* camouflage regulations issued on 5th June 1933, all aircraft except trainers and camouflaged machines should have their vertical tail painted red to make them more visible on the sea.

As a result of these regulations, the first production E14Y1s were painted silver overall with the exception of the vertical tail, which was painted red. The engine cowling and the front part of the

fuselage were black. Floats were silver with red warning stripes in the same place as on the prototypes. *Hinomarus* without white outlines were painted in standard positions. A white identification marking/code was painted on the fin.

Production E14Y1s equipping submarines in the second half of 1942 had upper surfaces painted dark green, and lower surfaces light grey. The engine cowling remained black. Upper surfaces of floats were dark green with the exception of an irregular light grey area beneath the wings. Hinomarus outlined white were painted in standard positions. From 1944 on *Hinomarus* were painted onto a white square. On the fuselage sides, just aft of the *Hinomaru*, as well as on the vertical tail, was the identification marking. The marking on the tail was blue with white outline, and on the fuselage white.

From 1940 on the combination of a character denoting the *Kokutai*, where the submarine belonged, and a Roman numeral denoting the unit included into the code system, was introduced. The numeral was the consecutive number of a submarine unit and was painted blue. For instance, in 1940 the code marking of a seaplane based on *I-5* (which belonged to the 1st Submarine Squadron and the first submarine *Kokutai*) was S I, but if the seaplane was based on *I-6* (8th Submarine Squadron, second submarine *Kokutai*), it wore the code T II. Markings were painted blue with white outline only on the vertical tail.

From July 1942 all submarine-based seaplanes belonging to the 6th Submarine Fleet were marked with a blue S. The combination of S with a Roman numeral denoted the individual submarine *Kokutai*. The numeral defined the consecutive number within individual Kokutais. For example, the marking S II was assigned to the second submarine *Kokutai*.

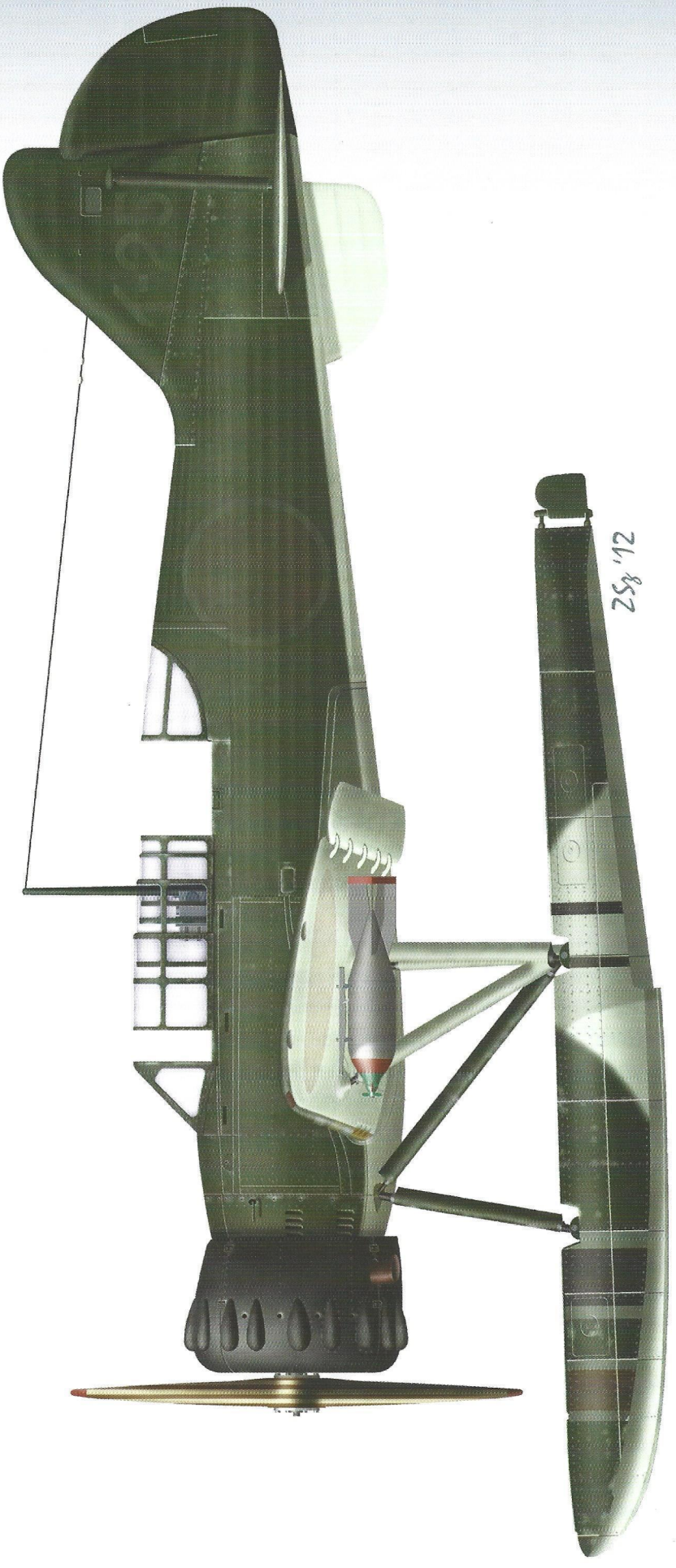
Due to security reasons not all E14Y1s wore identification markings. A pilot of an *I-21*-based E14Y1 mentions that his aircraft had the Hinomaru painted over, and the entire seaplane was camouflaged green to make it less visible. He mentioned also that numerous submarine-based E14Y1s were devoid of code markings.

From 1st September 1943, according to the order issued by the command of the 6th Submarine Fleet, the subordinated aviation unit was assigned the identification number 671. The first digits (67) identified the 6th Fleet, and the third digit (1) denoted the aviation unit equipped with E14Y1s at Kure naval base. It is quite possible that seaplanes were assigned to individual submarines only when their mission required use of a seaplane.

From August 1944 all submarine-based seaplanes were grouped in a unit subordinated to the 6th Submarine Fleet. Their markings consisted of the code number 671 and a number assigned to an individual seaplane, e.g. 671-05, 671-08, 671-10, 671-11 and 671-15. The markings were painted on the fin, and the individual number on the fuselage. The fin marking was blue with white outline, and on the fuselage the number was white, but without the digit '0', i.e. just 5, 8, etc.

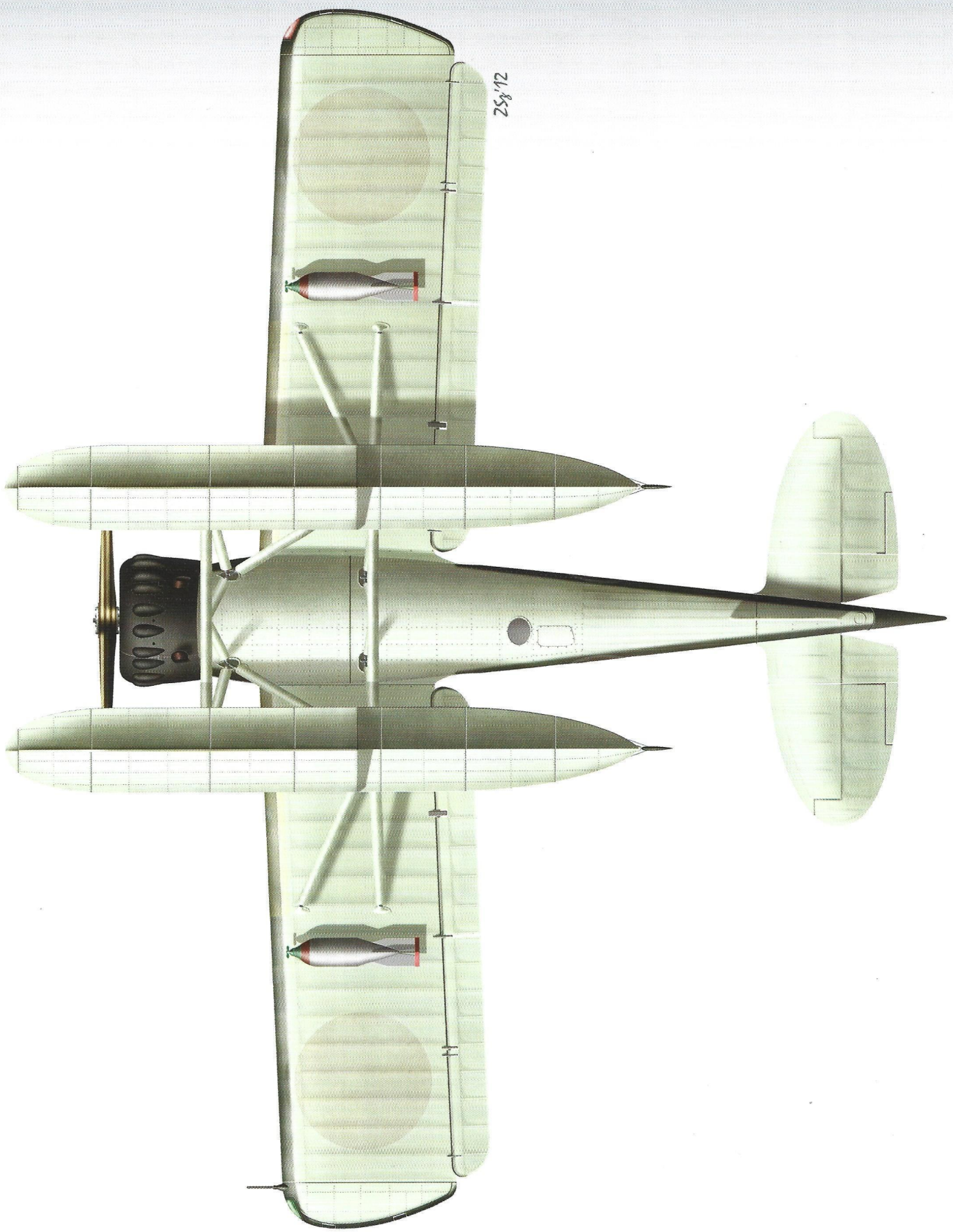
Camouflage and markings of Nobuo Fujita's E14Y1

According to the memoirs of Nobuo Fujita his seaplane wore special camouflage. Upper surfaces and struts were dark green, and lower surfaces were light grey. The engine cowling was black. On the upper surface of the horizontal tailplane were white oblique lines helping the observer to aim his machine gun. By his recollection, "*All the Hinomarus were lightly oversprayed with dark green paint so they were hardly recognizable from a distance.*" Therefore, *Hinomarus* on fuselage sides and on the main wing were painted over with dark green. He didn't mention the *Hinomarus* on the underside of the wing, but it is thought that they were (or had been) also painted over with light gray. It is natural to think that the white code of "I-25" on the vertical fin was also painted over with dark green for security reasons. Airscrew tips were red. On the floats red and black warning stripes with white outline were applied in the same position as for production a/c. However, there is a possibility that all the markings, including float stripes, IFF yellow wing bands, and white oblique lines on the tail plane, were painted over for the security reason.



This and next pages: *E14Y1 Model 11, of* **I-25** *submarine used to attack US territory. Aircraft was piloted by Nobuo Fujita. Note all the markings are over-sprayed.*


25/12



Kugisho E14Y1 Model 11 reconnaissance seaplane technical description

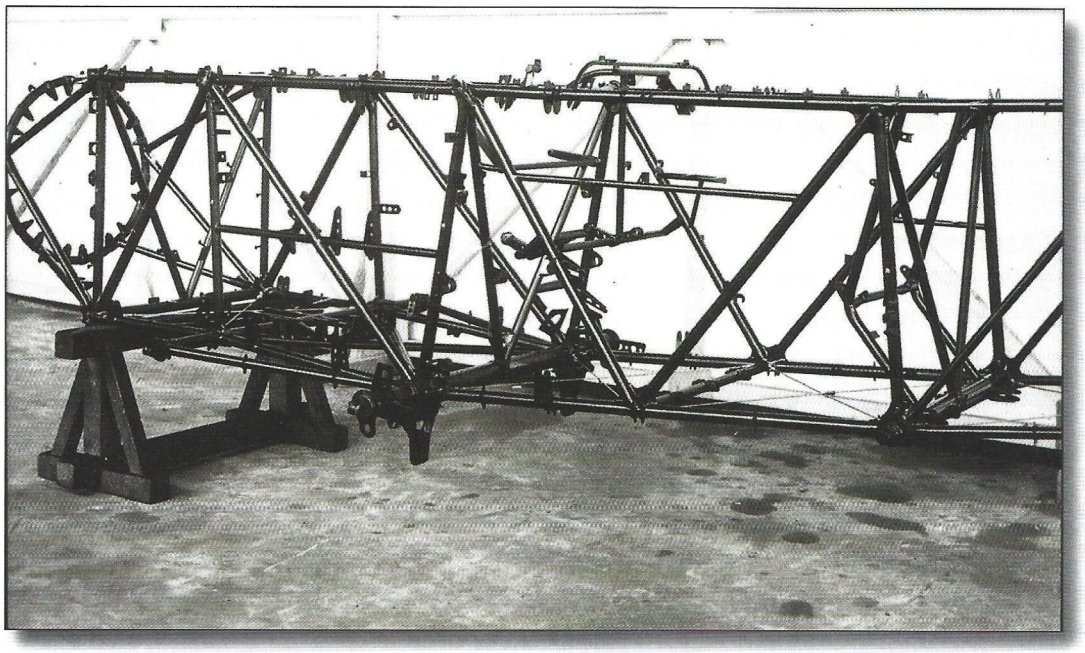
The Kugisho E14Y1 Model 11 seaplane was a single-engine two-seat cantilever low-wing monoplane on two floats, with enclosed cockpit for the pilot and observer.

Forward fuselage was circular, changing further aft to oval. The frame of of the fuselage was welded from thin-walled tubes of Ha-202 chromium-molybdenum steel. Formers and longerons were attached to the frame. The forward fuselage had smooth duralumin covering, the outer skin of the fuel tanks and wing fairing. Rear fuselage around the tailplane and fin attachments had similar structure. The rear fuselage had wooden formers and stringers covered with doped fabric Fabric covered frames and stringers of the rear fuselage were made of thin profiles as they were not subject to high loads.

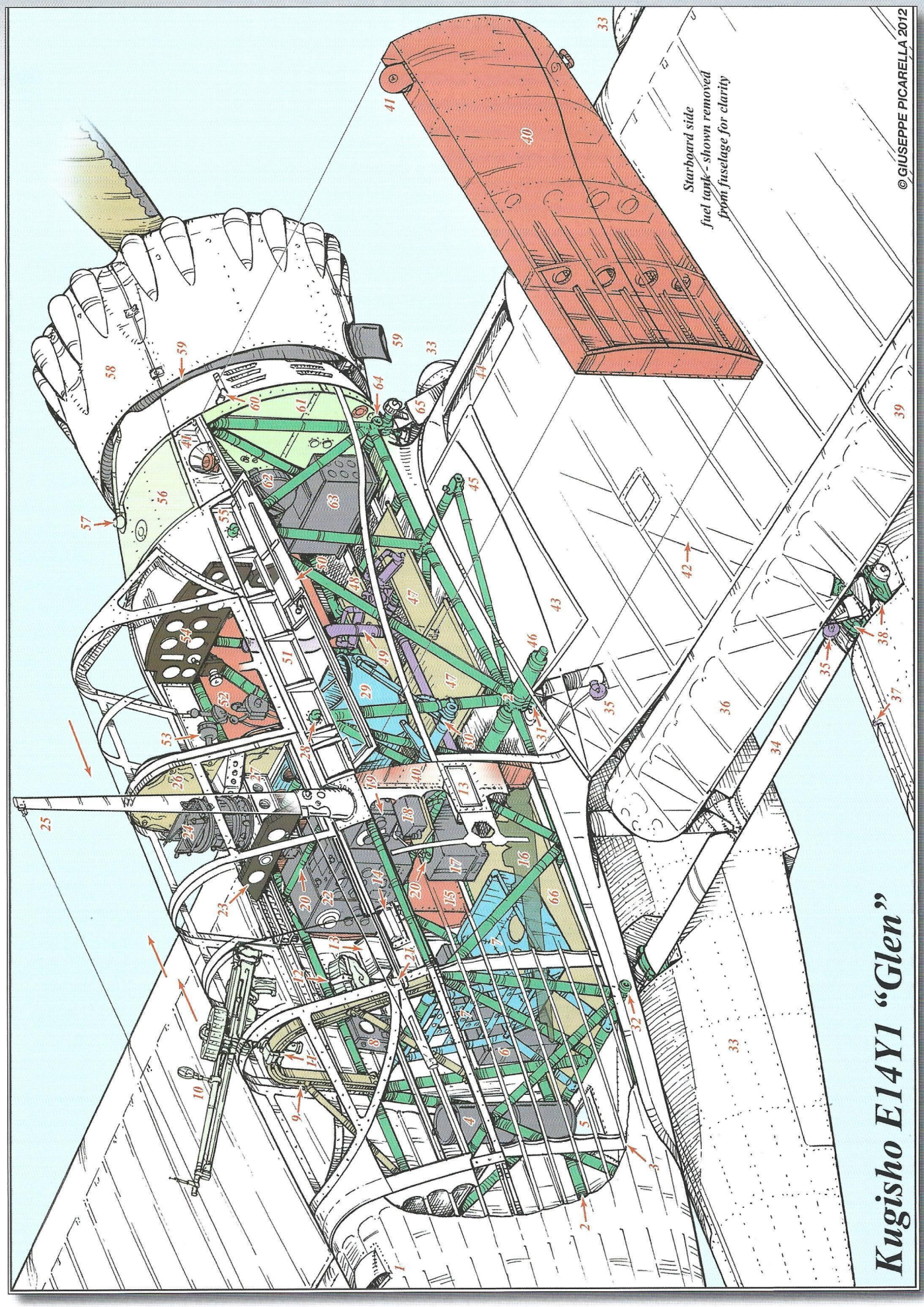
The Hitachi *Tempu* 12 radial was attached to a circular engine mount, which translated into square-section in order to attach to the four longitudinal fuselage frame sections at bay 1-2, with a fireproof bulkhead built up at the interface of the two assemblies. It was nearly circular to make it possible to attach the engine cowling. It was made of two types of sheet metal. On the engine side it was 0.3 mm thick steel, riveted together with 0.7 mm thick duralumin. A 246 mm circular opening in the middle of the bulkhead allowed servicing access to the DC generator connected directly to the engine.

A 31 litre oil tank was located on top of the fuselage framework immediately aft of the engine mount, forming the fuselage profile ahead of the windscreen. Low oil level was signalled when 6 litres were left in the tank. Dipstick and oil filler were located forward of the windscreen. Two 170 litre fuel tanks (total capacity 340 litres) were attached to the outer sides of the fuselage frame, between bays 1-2, extending aft beyond fuselage bay 5-6. Fuel filler openings were located in the upper longeron fairings ahead of the windscreen.

On both sides of the cockpit along the sills were compartments for the hoisting cables used to quickly lift the seaplane onto the submarine deck and to place it on the catapult with the onboard crane. Two eyes were located in each compartment, the steel cables being attached to them. A 7 mm cable was connected to the forward eye, and a 6 mm cable to the other one. Ends of both



Overall view of the fuselage frame, with circular engine mount to the left of the photo. To reduce the weight of the structure to a minimum, the frame was welded from thin-walled chromium-molybdenum steel tubes. Pilot's seat was attached in line with the third vertical tube, while the observer's seat was attached to the fourth tube.

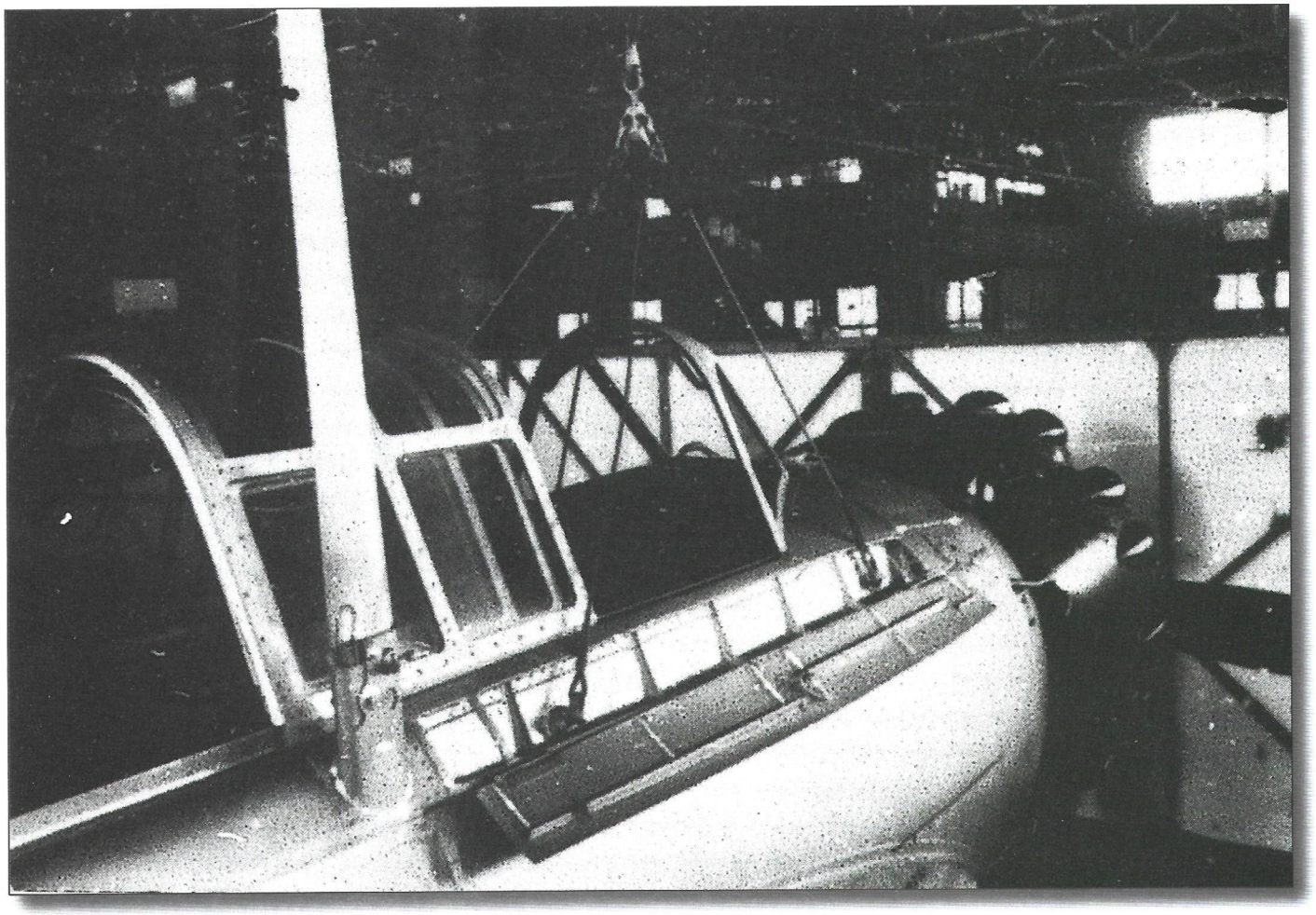

Kugisho E14Y1 "Glen"
Starboard side
fuel tank- shown removed
from fuselage for clarity
© GIUSEPPE PICARELLA 2012

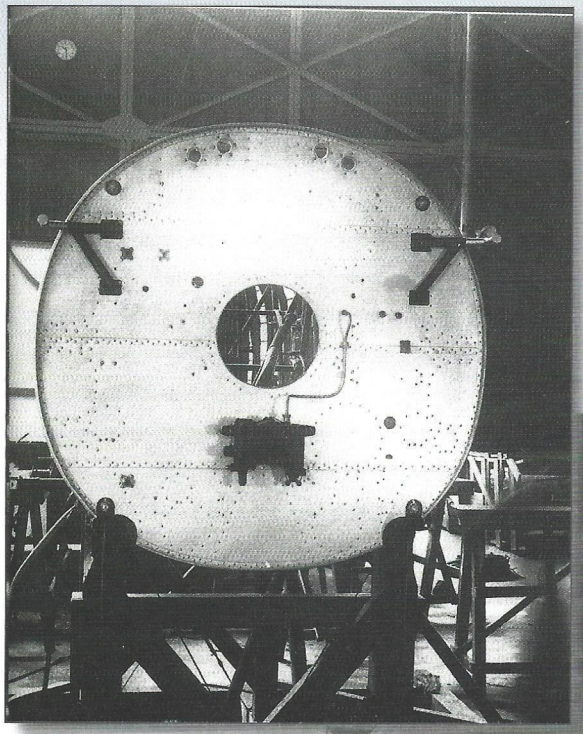
Kugisho E14Y1 "Glen" cutaway

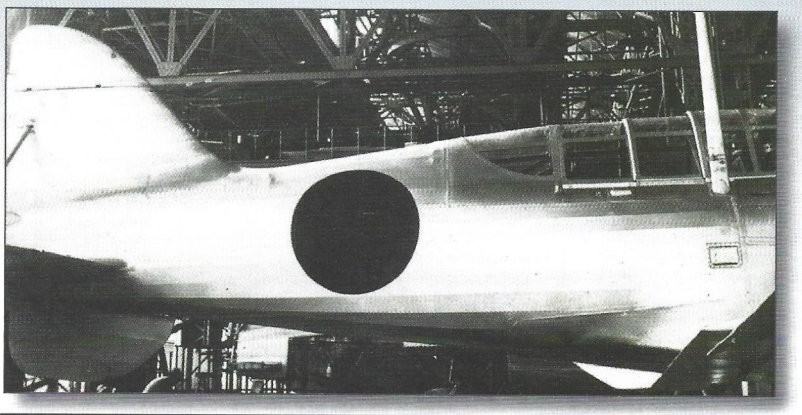
1 Fuselage vent
2 Fuselage frame – thin-wall Chromium-Molybdenum steel tubes
3 Rear fuselage support structure – wooden formers and stringers with doped linen covering
4 Flare tube
5 Flare aperture
6 Flare case
7 Observer's bucket seat – pan folds up to allow observer to stand while using the rear firing machine gun
8 Rear cockpit electrical panel
9 Machine gun runner and support frames
10 Type 92 (7.7mm) flexible machine gun
11 Machine gun attachment bracket
12 "Lewis" type ammunition drum 97 rounds per drum – three drums carried in aircraft
13 Rear cockpit kick-in boarding step – both sides
14 Sill step – both sides
15 Fuel tank – Port side
16 Gun stowage location
17 Dynamotor
18 Telegraph key
19 Antenna tuner
20 Radio attachment arms
21 Antenna mast stowage clip
22 Type 96 Ku Mk.2 Command/liaison radio
23 Observer's instrument panel
24 Model 1 compass
25 Antenna mast – folds for stowage
26 Cockpit windbreak panel – canvas
27 Compass/instrument panel support structure
28 Hoisting point (rear) – both sides
29 Pilots adjustable seat
30 Seat frame and adjustment handle
31 Float strut (rear) attachment point – both sides
32 Launch cradle (rear) attachment point – both sides
33 Float assembly – both sides
34 Float (rear) attachment strut assembly
35 Float rudder control pulleys – Starboard float only
36 Flap assembly
37 Float rudder cables and fairleads
38 Float strut quick release attachment brackets
39 Aileron
40 Fuel tank assembly (170 litres per tank, 370 litres total) forms the upper portion of the forward fuselage exterior skin, while the lower portion is faired into the wing root – both sides
41 Fuel tank filler neck – both sides
42 Forward and rear float strut diagonal strut
43 Walkway – both sides
44 Leading edge fixed slot
45 Fuselage to wing spar attachment fitting – forward
46 Fuselage to wing spar attachment fitting – aft
47 Pilot's floor and heel runners – wood and aluminium alloy
48 Rudder pedal assembly

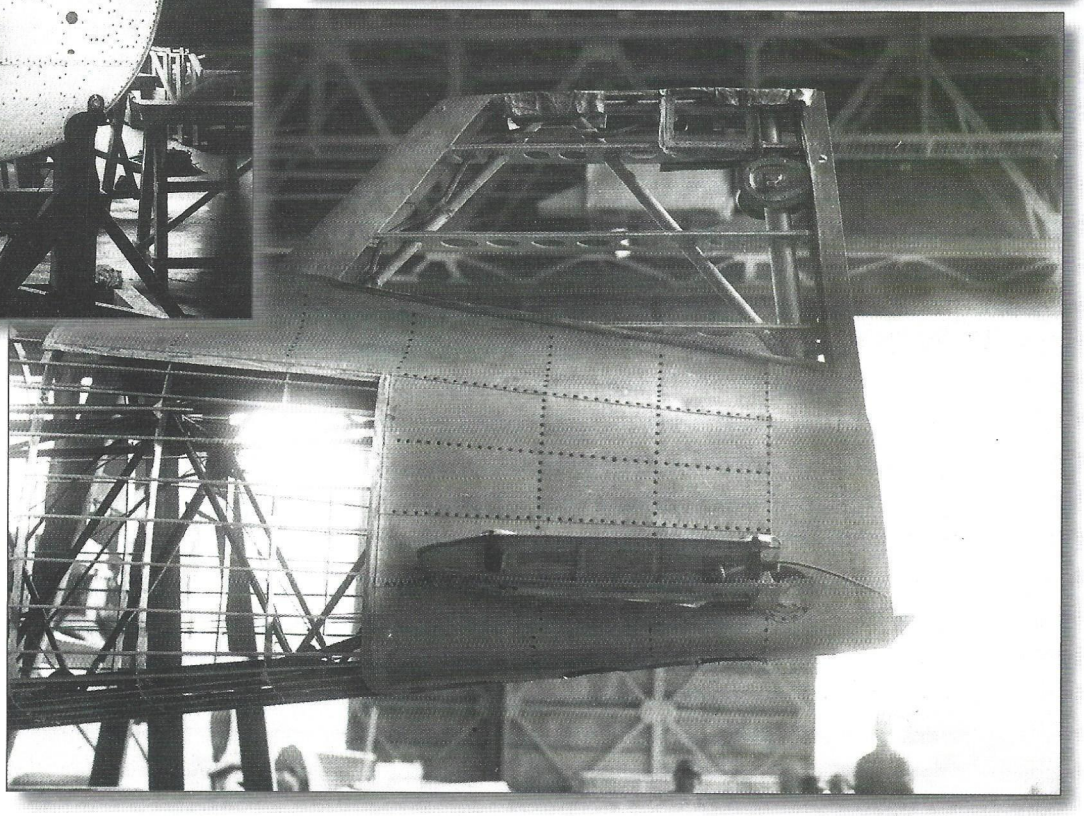
The method of raising the seaplane from the sea and placing it on the catapult using the crane. On both sides of the cockpit there were oblong covered compartments with two eyes to which steel cables were permanently attached. Ends of the cables were connected by a link common for one side of the airframe. Both these links were attached to the split hook lowered from the crane. An aerial mast, folded during disassembly, was fitted on the starboard side of the fuselage, as shown here.

49 Control column assembly
50 Hoist point access panel – both sides
51 Fuselage upper sill structure (aluminium alloy) contain hoist attachment points, canopies and canopy rails – both sides
52 Throttle quadrant
53 Cockpit light – both sides
54 Pilot's instrument panel
55 Hoisting point (forward) – both sides
56 Oil tank – 31 litres
57 Oil return pipe
58 Four-piece cowling with sculpted upper sections for better visibility during landing
59 Collector ring and exhaust
60 Hand hold – both sides
61 Firewall – steel and aluminium alloy
62 Engine mounted DC generator access panel
63 Electrical junction box and battery box
64 Float strut and launch cradle (forward) attachment points with quick release attachment brackets – both sides
65 Float (forward) attachment strut assembly
66 Observer's floor panel – wood

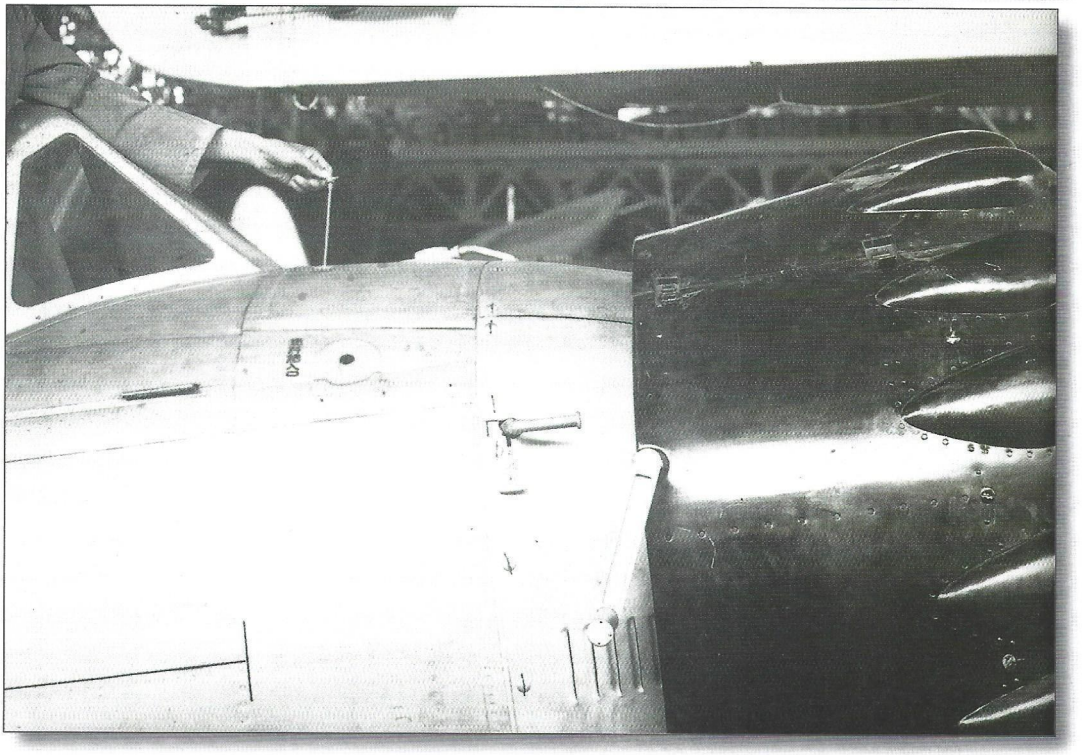








Above: Fuselage fireproof bulkhead seen head-on. The bulkhead was made of 0.3 mm thick steel and 0.7 mm thick duralumin. A 246 mm circular opening in the middle of the bulkhead allowed servicing access to the DC generator.
***Right:** Port side of the fin with skin partially removed.*
***Top, Right:** View of the starboard side of the rear fuselage, fabric covered. Stringers can be clearly seen under the fabric. Note also the long aerial mast that was folded along the fuselage during stowage in the deck hangar. A covered footstep is located on the side of the fuselage to facilitate entry into the observer's cockpit.*
***Right:** Starboard side of the forward fuselage. Near the edge of the engine cowling can be seen a manual start-up crank, The inspection opening ahead of the windscreen allowed checking of the lubricant oil level. Fuel filler was located under the circular cover on the starboard side of the fuselage.*



The complete multi-section cockpit canopy. The windscreen is at the front, with the pilot's backward sliding hood immediately aft. A fixed section is in the middle, onto which both the forward and the rear (observer's) hoods slide. The rear fixed section is located aft of the observer's cockpit. All sections had 2 and 3 mm thick perspex glazing. An aerial mast was fitted on the starboard side of the fuselage near the observer's cockpit. A folding footstep to facilitate entry into the observer's cockpit can be seen on the side of the fuselage.

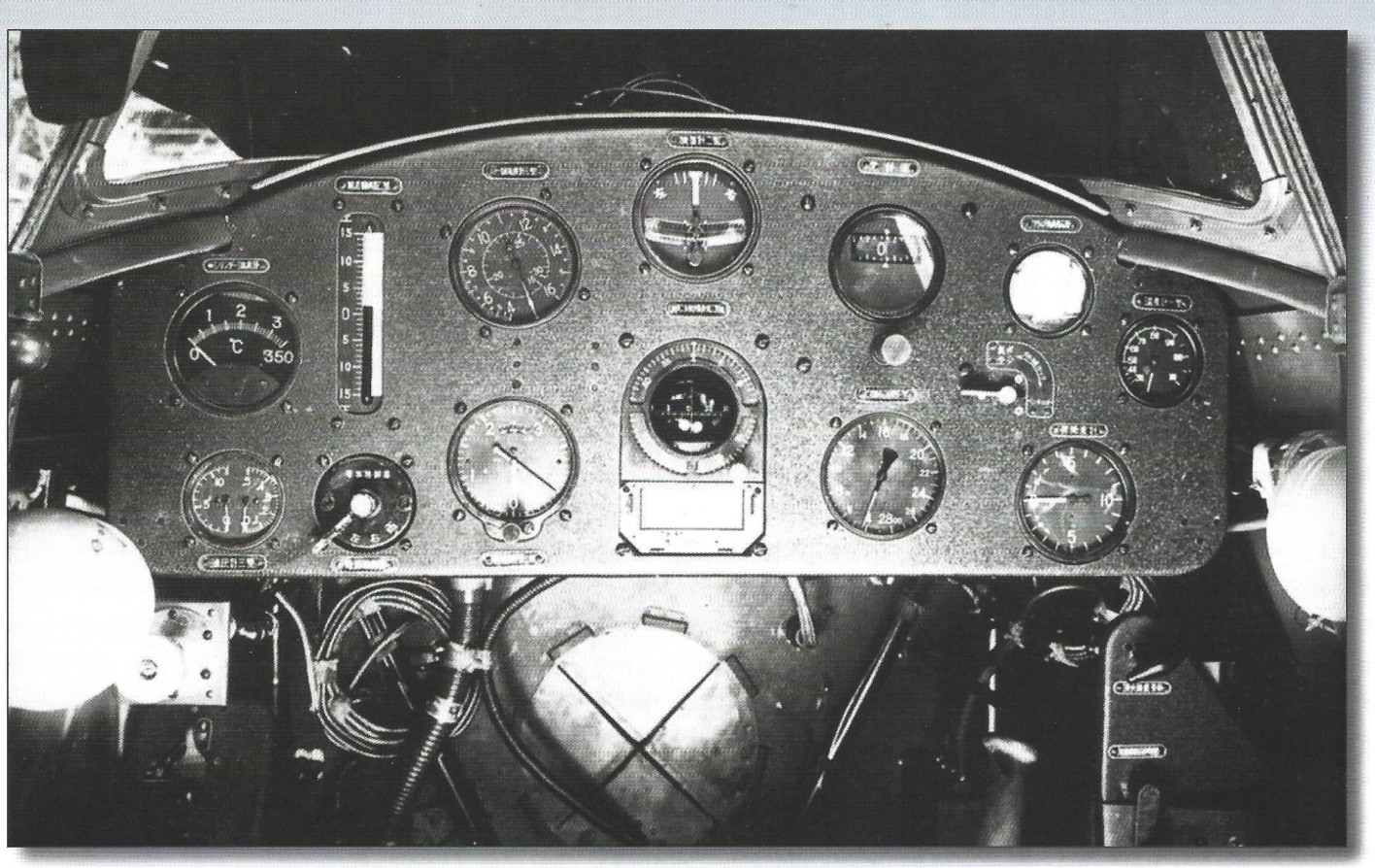
cables on one side of the airframe were connected by a common link, and both these links were attached to the split hook of the crane. The tail hoisting cable was made of 6 mm flax cord.

An aerial mast was fitted on the starboard side of the fixed portion of the cockpit canopy, to support the wire aerial extending from the mast to the fin, level with the upper removable stabilising portion. During disassembly of the seaplane before placing it in the deck hangar the mast was folded backward along the fuselage.

The two-seat cockpit was covered with a multi-section canopy, consisting of three fixed sections and sliding hoods above the pilot's and observer's seats, with the pilot's canopy sliding to the rear over the fixed centre section and the observer's two-piece canopy sliding forwards under the centre section. The rear fixed section was located aft of the observer's cockpit. All sections had duralumin profile framing, and 2 and 3 mm thick Perspex glazing. A folding footstep was located on the side of the fuselage to facilitate entry into the observer's cockpit. A flare tube aperture is believed to have been located immediately behind the observer's seat. An observation window and a servicing inspection hatch were located in the duralumin covered section of the observer's cockpit floor. Covered footsteps were located on both sides of the fuselage to facilitate entry into the observer's cockpit.

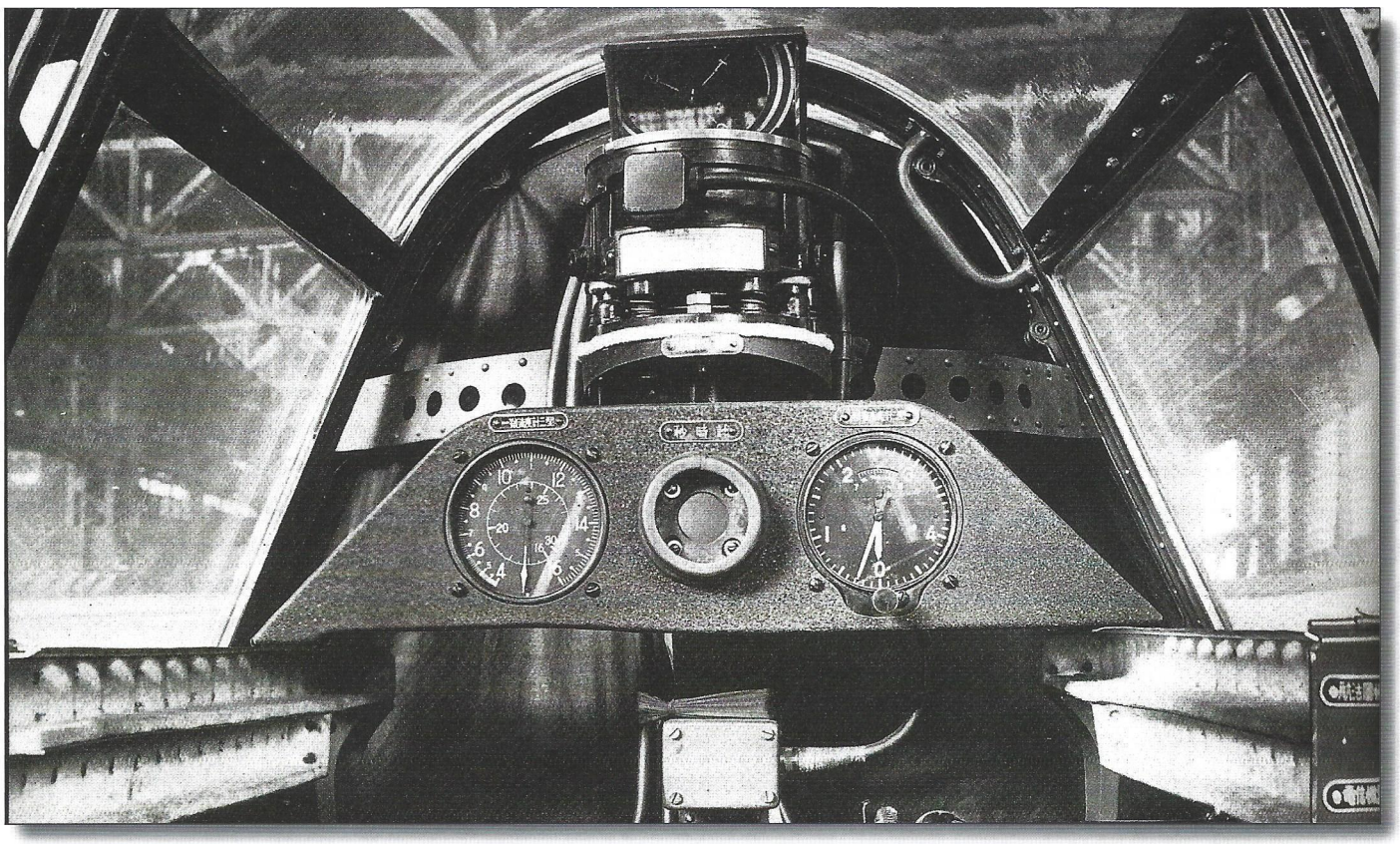
The cockpit was equipped with flying and navigation instruments, engine controls and flying controls. The pilot's cockpit had a simple panel without any sophisticated instruments, as the aircraft was small and light. The instrument panel was made of 2 mm thick high-strength Chi-211 duralumin. The panel was painted in matt black. It was mounted on five metal-rubber anti-vibration shock-absorbers, two of which were located in the upper part, one in the middle, and two in the lower part of the panel. Instruments were scaled and located according to the Navy air arm standards. At night instruments were illuminated by lamps on both sides of the cockpit. The top row of instruments included, left to right, circular outside air temperature indicator, rate-of-climb indicator, airspeed indicator, turn-and-bank indicator, flap position indicator and temperature indicator. The lower row included oil pressure indicator, ignition switch, altimeter, compass, rev counter and rate-of-climb indicator.

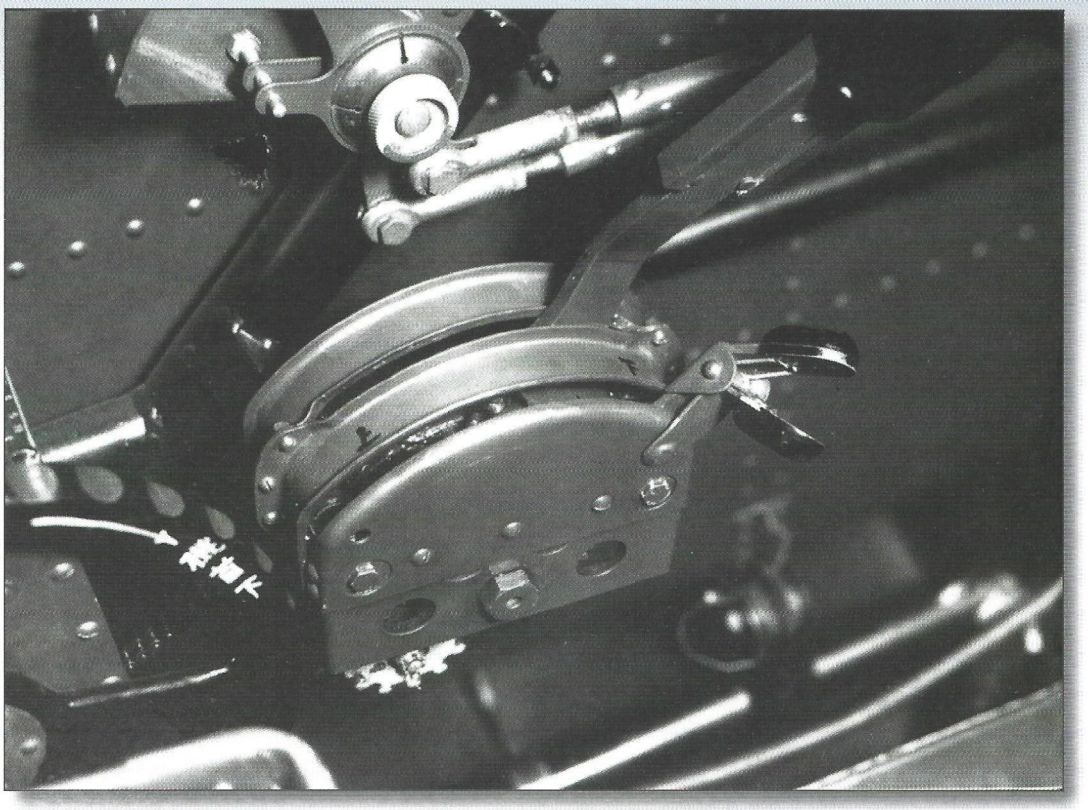
The engine control quadrant was located in the usual position on the left-hand side of the cockpit and a vertically adjustable and sprung pilot's seat was fitted. The primary electrical junction box and battery occupied the floor space ahead of the pilot's rudder pedals.

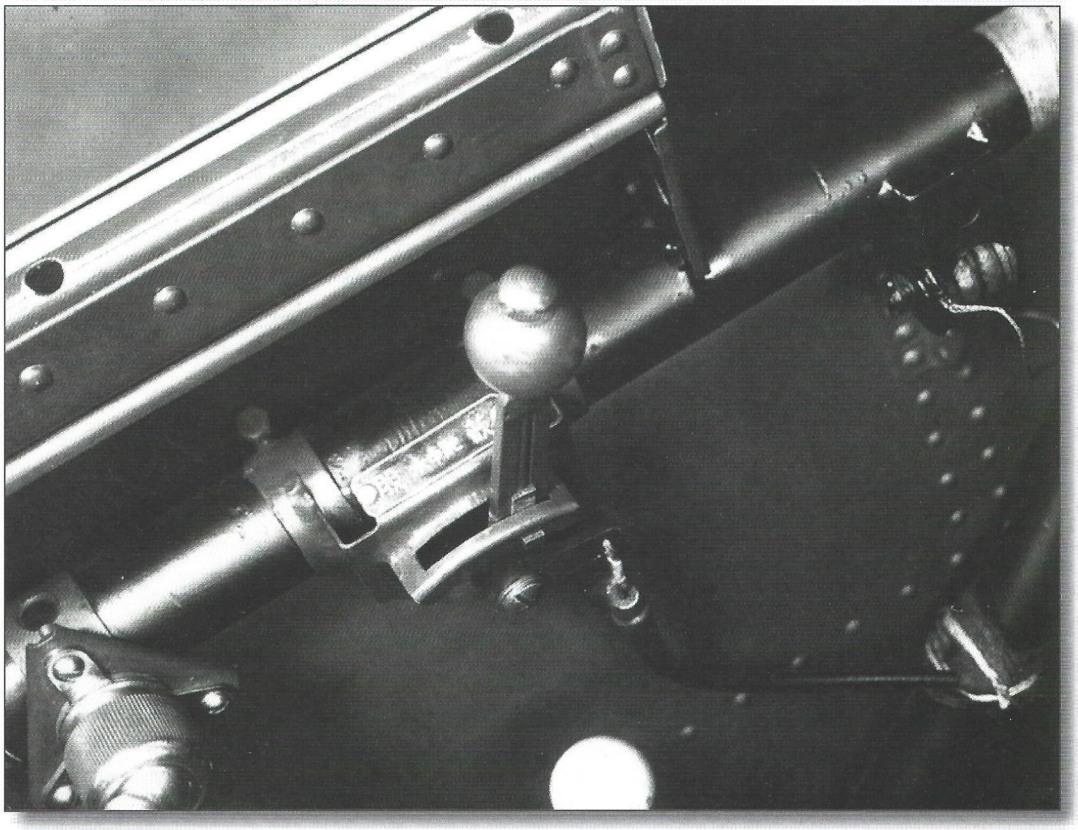


Above: Forward instrument panel in the pilot's cockpit. The top row included, left to right, circular exhaust temperature indicator, fore-and-aft indicator, airspeed indicator, turn-and-bank indicator, direction indicator, flap position indicator and oil temperature indicator. The lower row included oil and fuel pressure indicator, magneto switch, altimeter, compass, rev counter and rate-of-climb indicator. The devices visible on sides are sockets of lamps to illuminate the instrument panel at night. To optical fuel level indicators can be seen on the starboard side under the panel.

Below: Instrument panel in the observer's cockpit. It included, left to right: airspeed indicator, time clock and altimeter. An aircraft compass was fitted above the panel between the cockpits.







Top: Landing flap control system was located on the port side of the cockpit. It consisted of a large control panel and a small lever. The position of the controls shown in the photo indicates landing flaps in lowered position. The first set of levers is in the extreme position on the control panel. It could be moved there and back. For example, to lower the flaps by 35° downward, the lever had to be moved 35 times. Controlling both flaps at the same time was an innovation in those days. Bottom: Water rudder control lever was located on the trusswork tube in the cockpit on the port side. Attachment of a cable connected with rudder pedals was located under the lever. When the lever was pulled, the connection of the rudder pedals with the water rudder was broken.

The rear cockpit of the observer/radio-operator contained an electrical control panel and a small tapered instrument panel made of 1 mm thick duralumin. It was attached to diagonal supports, to which map compartments were also mounted. The panel included the following instruments: airspeed indicator, altimeter and time clock. A small *Koku Rashingi 2-Gata Kai* aircraft compass was fitted on a central support structure between the cockpits, which also acted as the pilot's back and headrest support.

A type 96 ku mk.2 command/liaison radio was suspended below the observer's instrument panel with the aid of support frame and standard bungee cords, together with associated radio ancillary equipment, such as a dynamotor, antenna tuner and telegraph key.

Control system of the aircraft consisted of pushrods connected to ailerons and flaps of each wing, and steel cables to actuate the rudder, elevator and trim tabs. The first prototype had a flaperon system, allowing use of the ailerons as landing flaps. During flight trials, flaps alone allowed a landing speed of 87 km/h, so the flaperon system was abandoned. The single, cable actuated float rudder was controlled from the cockpit using the pedal, with rudder deflection by 38°.

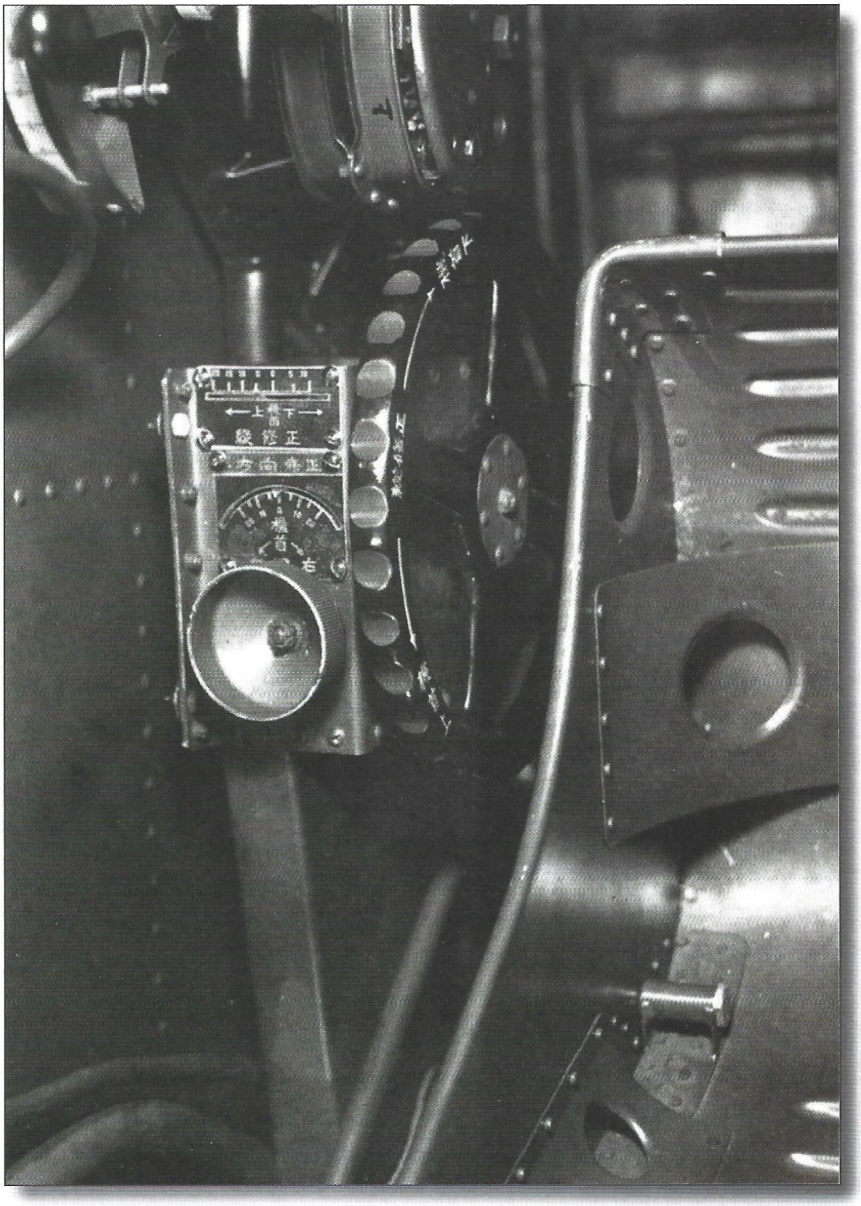
Rectangular wings with round tips were cantilever, two-spar, two-piece, of all metal design, with 19 ribs (including five reinforced ones). Each half was attached to the fuselage with two bolts. Wing chord (less aileron) was 1.51 m, and aspect ratio (including flaps and ailerons) was 5.1. Wing leading edge sweep was 2°52', dihedral was 5°, and incidence was 4°. The wing structure, stiffened with steel cables, was fabric covered. Wing tips were covered with duralumin, flush riveted. The leading edge (torsion box) and walkway area at the wing root was covered with Japanese cypress plywood. Because of vortices between the wing root and the fuselage, a fixed slot was fitted on the leading edge between the second and fifth ribs. Under-wing float struts were attached to the bottom wing surface at two strengthened joints.

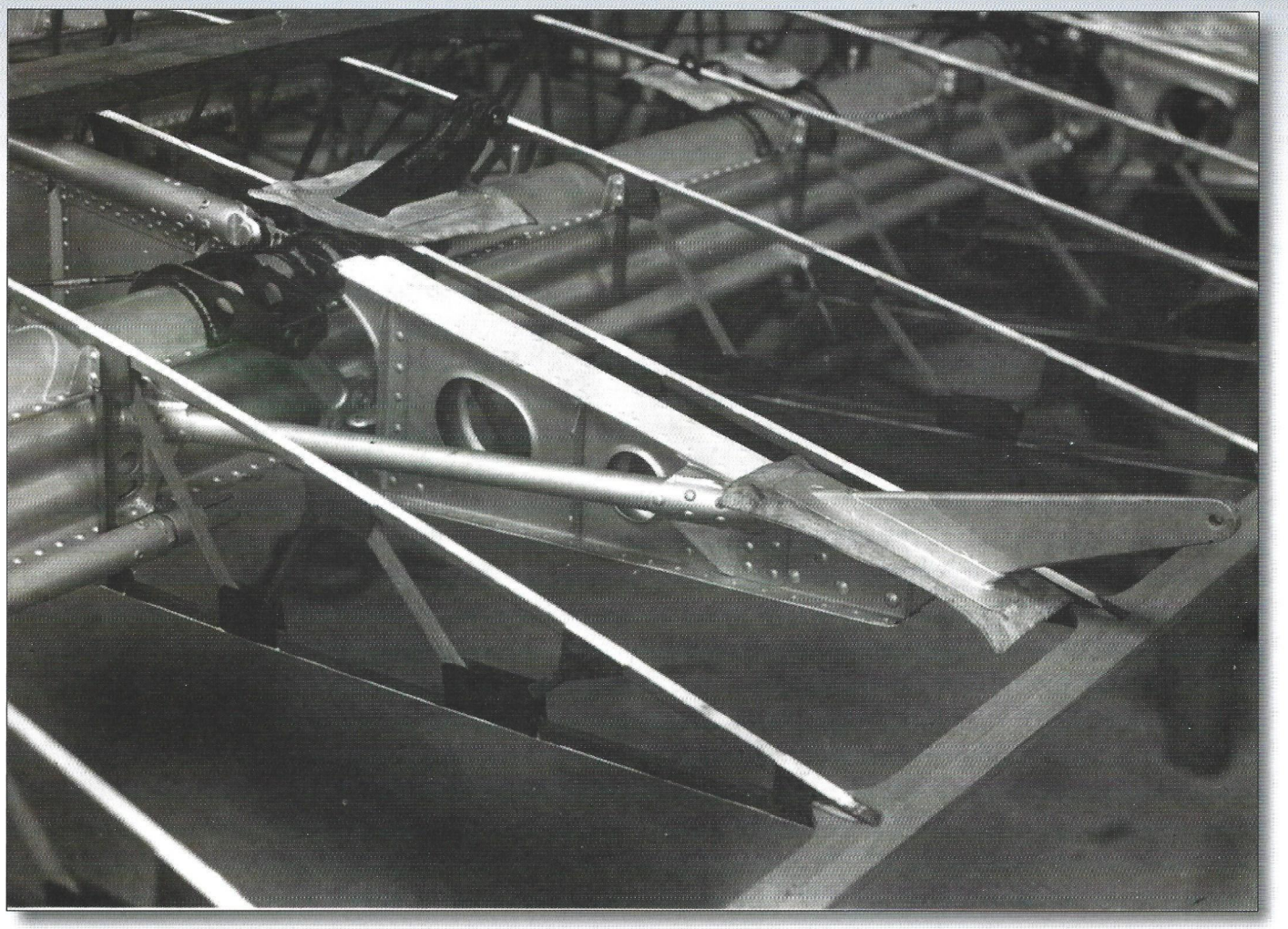
The wing was fitted with flaps and ailerons, attached on five supports aft of the trailing edge. The ailerons, 2.174 m long each and with a combined area of 1.572 m², had metal construction and were fabric covered. The aileron could deflect 20° upward and 15° downward. The flaps, 2.241 m long each and with a combined area of 1.624 m², also had metal construction and were fabric covered. They could deflect downward by 35°. Overall length of each wing was 4.81 m, and the chord was 1.888 m. The pitot tube was fitted in the leading edge of the starboard wing. When the wing was removed for stowage, both the aileron and flap were folded underneath the wing. Navigation lights were fitted in the wing tips. Carriers for two light 30 kg bombs were fitted under the wing outboard of the floats.

Elliptic horizontal tail surfaces had mixed three-piece construction. The tailplane with a span of 3.76 m was supported by profiled struts. Central portion of the tailplane and elevator was fixed, while the tips of the tailplane and elevator were folded upward and supported against the fin, while the struts were released from their catches and they hung freely, supported against the leading edges of the fixed portion of the tailplane. The tailplane had tubular two-spar metal construction, with plywood covered forward portion and the rest was fabric covered. Elevators were also fabric covered. They deflected 20° upward and 10° downward and were fitted with adjustable trim tabs.

The fin had a tubular metal spar with plywood covered forward portion, and was

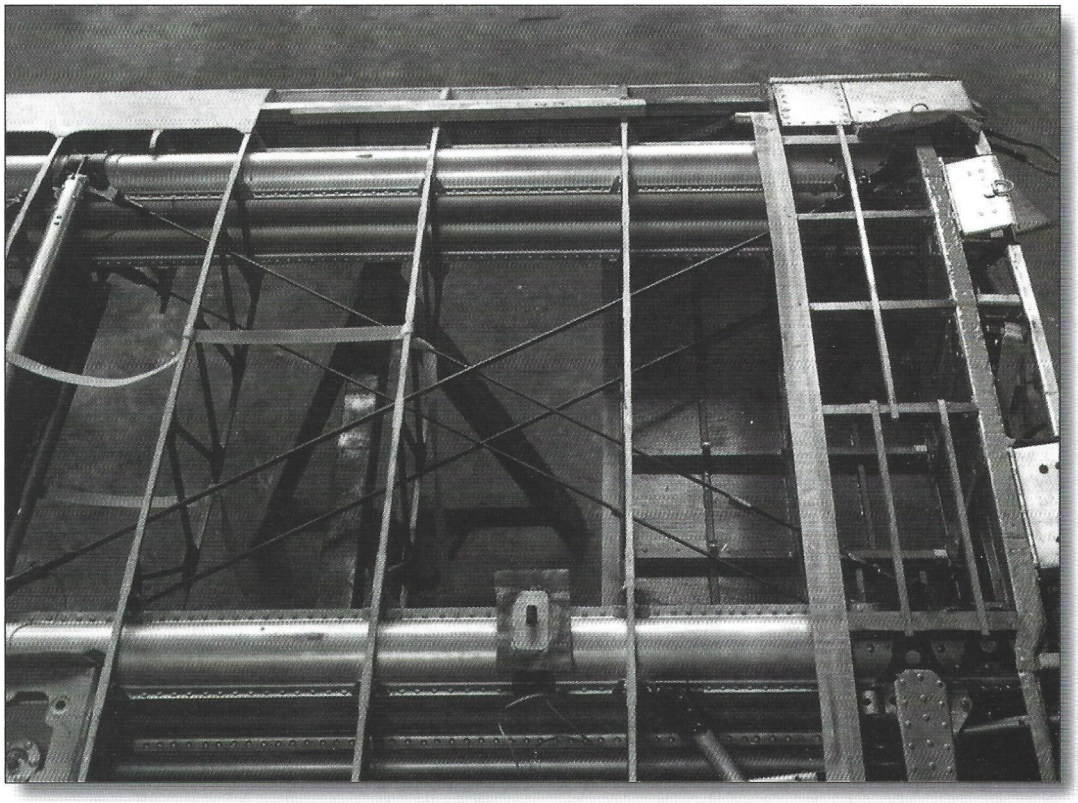
Rudder and elevator trimming system. Rudder trimming was achieved via a steel cable connected with a small wheel located on the port side of the cockpit. One full circle gave 11° deflection. The elevator trim tab was controlled with a small wheel, one full circle gave 6° deflection.





Port wing structure. Fuselage attachments, narrow pads between ribs for the wing walkway leading to the cockpit, and handles for carrying the wing before assembly and after disassembly can be seen on the right. The cruciform cables between the front and rear spars served to prevent wing twist. At lower left can be seen part of the inspection opening for flap attachment adjustment. In parts the structure was covered with Japanese cypress plywood.

Above: *One of five supports on the wing trailing edge as seen from below. The aileron was attached to three of these, and the flap to two. Note one of two supports for under-wing float struts.*

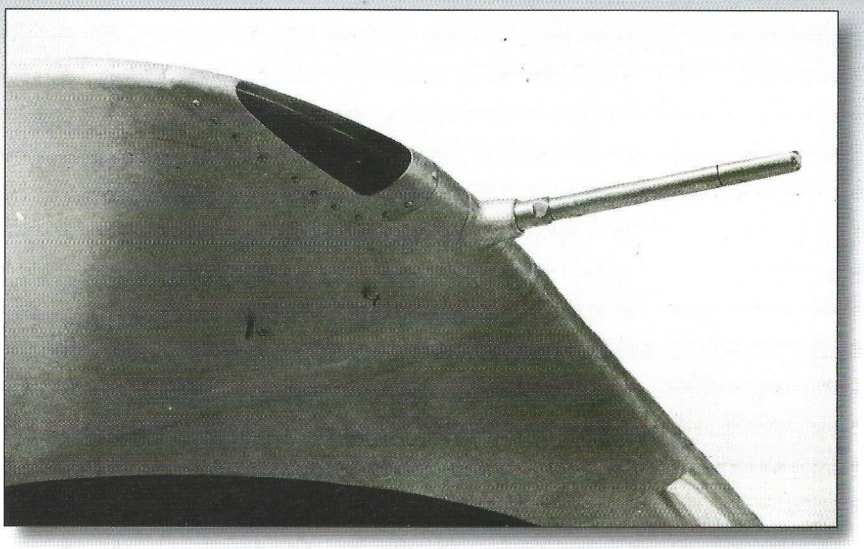


covered with flush-riveted duralumin panels at the joint with the fuselage. The rudder also had fabric covered metal construction, and was fitted with a trim tab. It deflected 20° to port or starboard. A similarly constructed stabilising extension was fitted on top of the fin, with a wood and fabric ventral fin under the fuselage. During folding of the aircraft for deck hangar stowage the upper fin extension was removed.

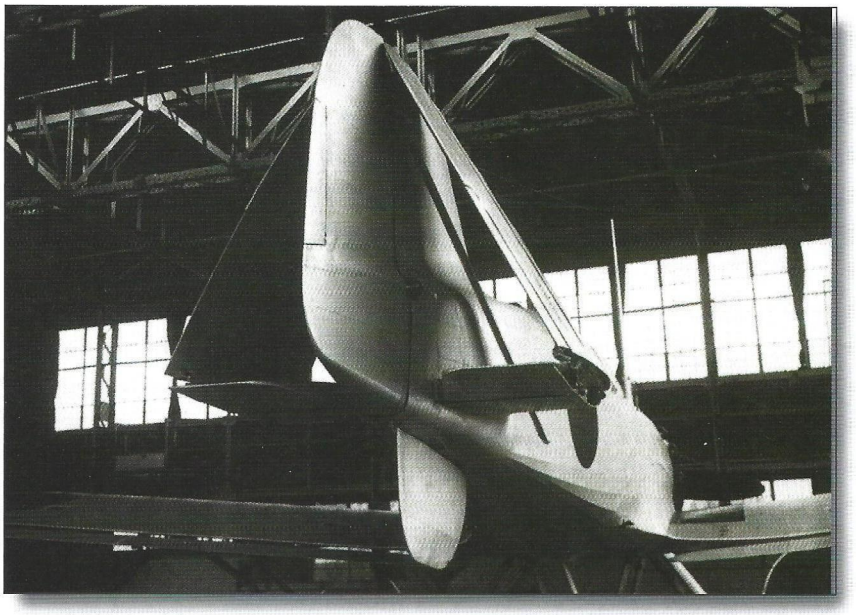
The seaplane had two floats 5.70 m long, with a track of 2.40 m. The floats were identical, except for single water rudder fitted on the starboard float only, to save weight. The floats had monococque all-metal construction from highly resistant SDCH grade duralumin, designated *Chi 232 Hei*. During WW2 Japan had the best experience in design of seaplanes and flying boats, so their float design was very advanced.

Floats were attached to the fuselage and wings by float struts. Although the float strut system seemed very complex, in truth it only consisted of six sub-assemblies that could be assembled and disassembled in a very short time.

Power plant was one 340 hp Hitachi *Tempu* 12 (Ha-22-12) 9-cylinder air cooled radial. This version was used solely in the E14Y1 seaplane and its design provided for the special servicing of the engine in submarines. In its standard version this was one of the most popular engines used in both Army and Navy aircraft (more than 10,000 were built). The engine was rated at 340 hp for take-off, and had a nominal rating of 300 hp at 1,800 rpm. It used '*Koku Ha-3 Kitatsuyu*' aircraft petrol with a specific gravity of 0.73 kg/l. The engine drove a 2.5 m diameter KW10 two-bladed wooden propeller with fixed pitch.

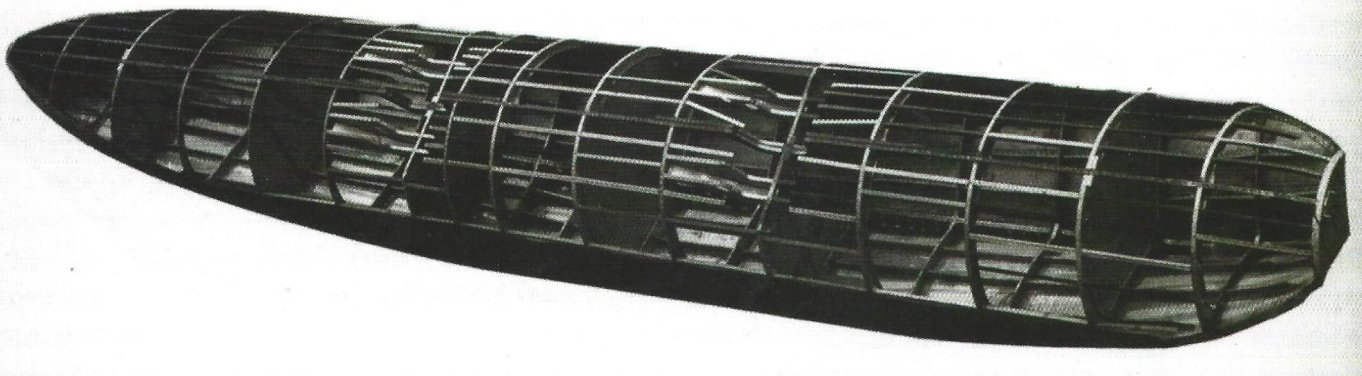


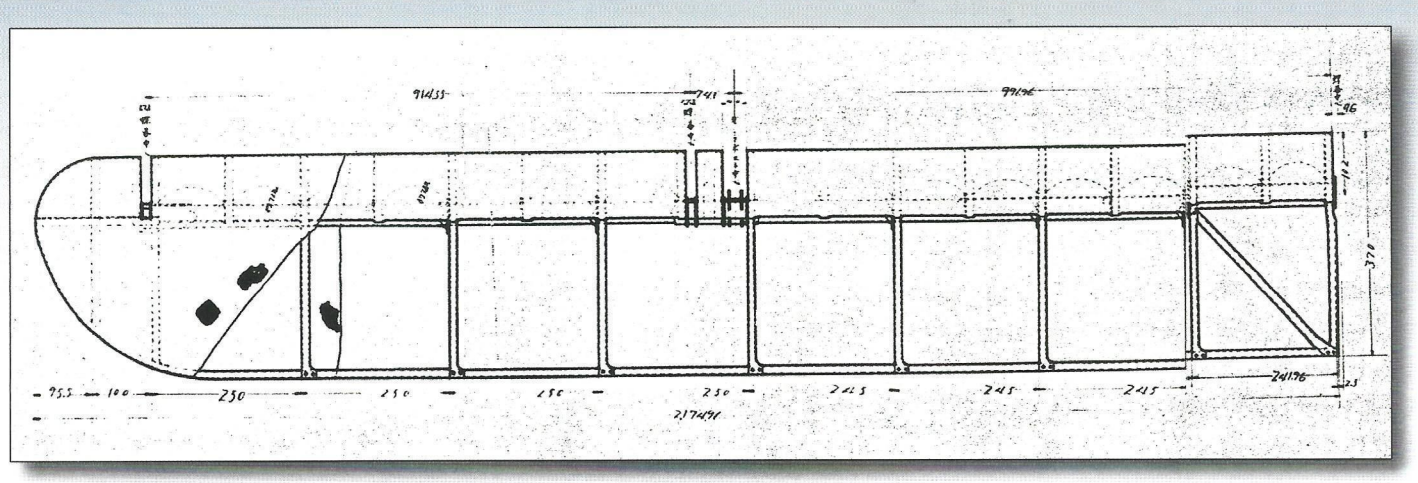
Pitot tube (airspeed indicator probe) was fitted on the starboard wing near the navigation light. It could be removed and stored.



Upward-folded tailplanes. Tips of the horizontal tail were folded 580 mm from the fuselage centreline. In this position the tailplane struts were released from their catches and supported against the leading edges. The upper fin extension was removed, while the ventral one remained in place.

Float structure. It was covered entirely with duralumin panels. The structure consisted of 16 frames and many stiffening stringers. To retain buoyancy when damaged, the float was split into separate air chambers.

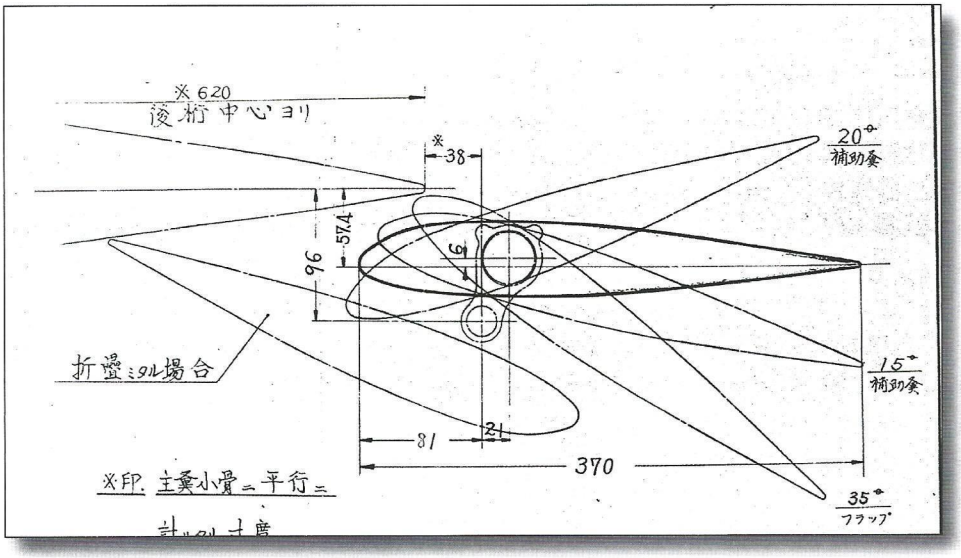




Drawings from original manual

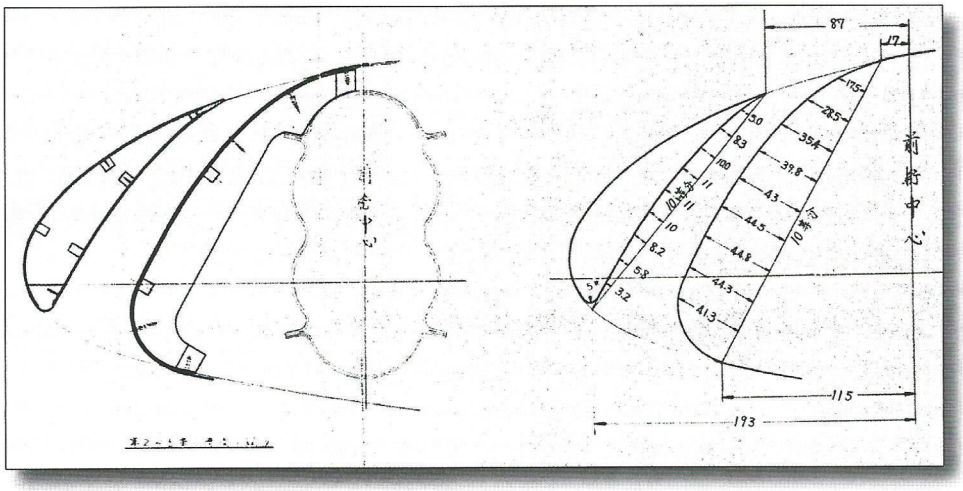
Top: *Aileron construction.*

Right: *The activation angles of aileron and flap It also shows the stored position.*



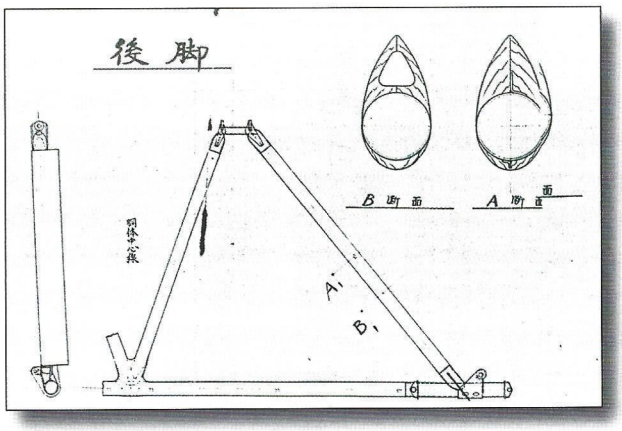
Opposite page: *The main wing profiles.*

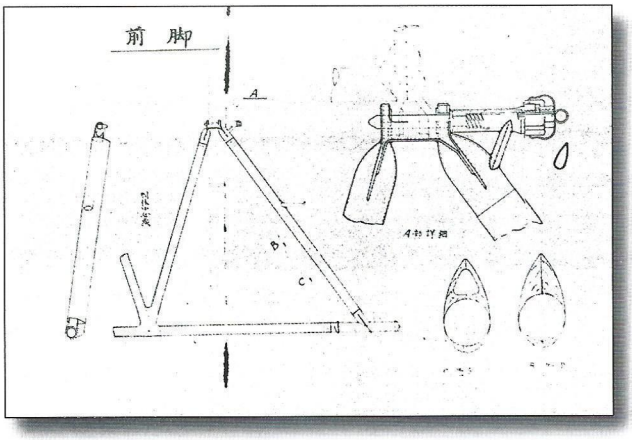
The cross-section of the leading edge fixed slot on the wing.

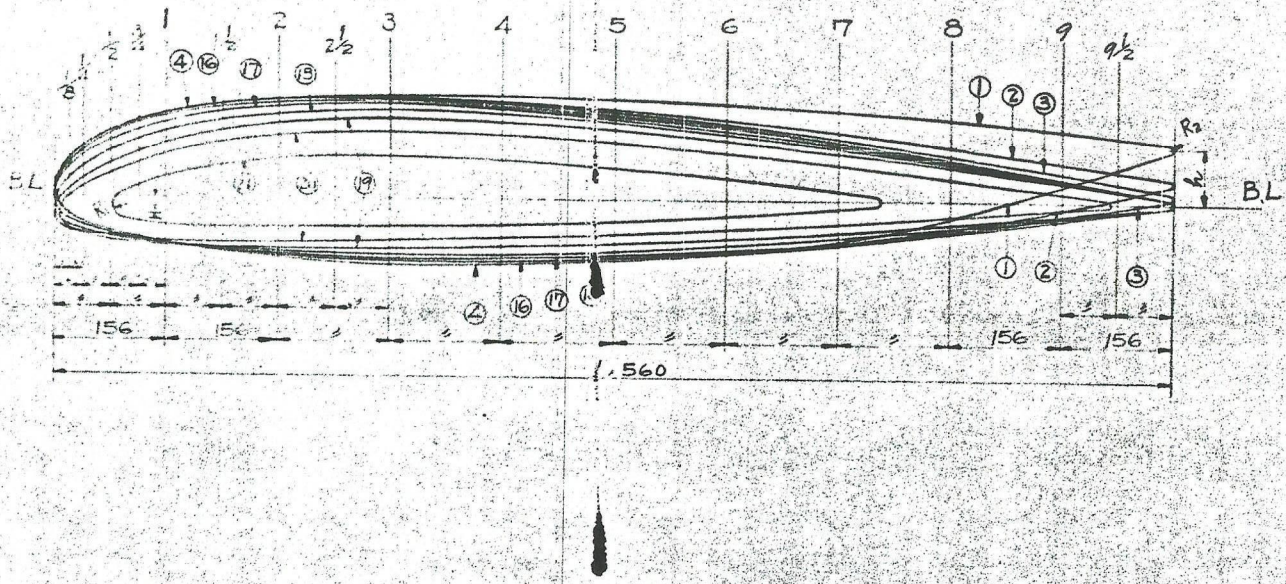


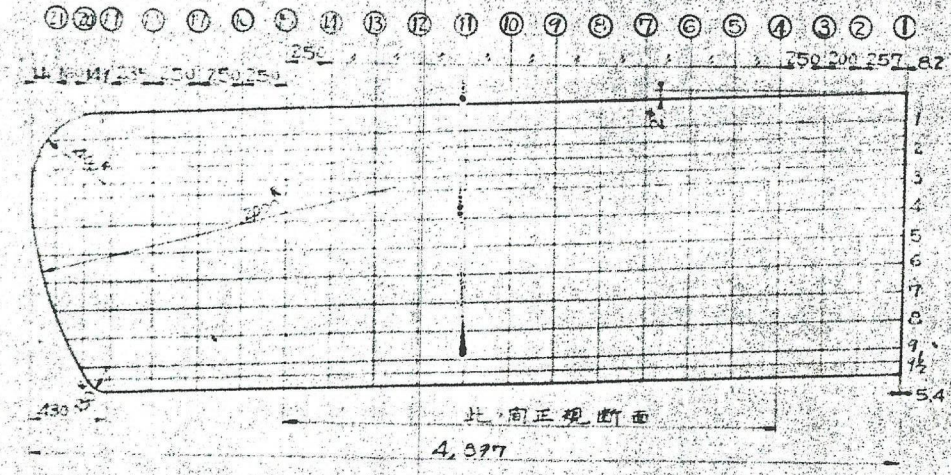
Bootom, left: *Rear struts with cross-sections.*

Bootom, right: *Forward struts with cross-sections.*







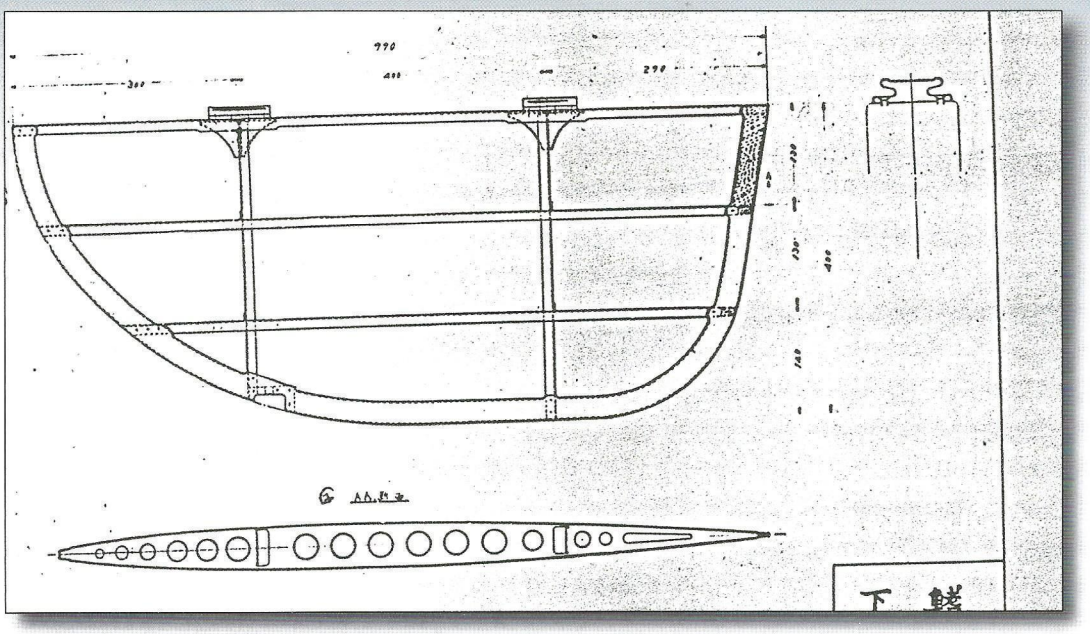


断面寸法表

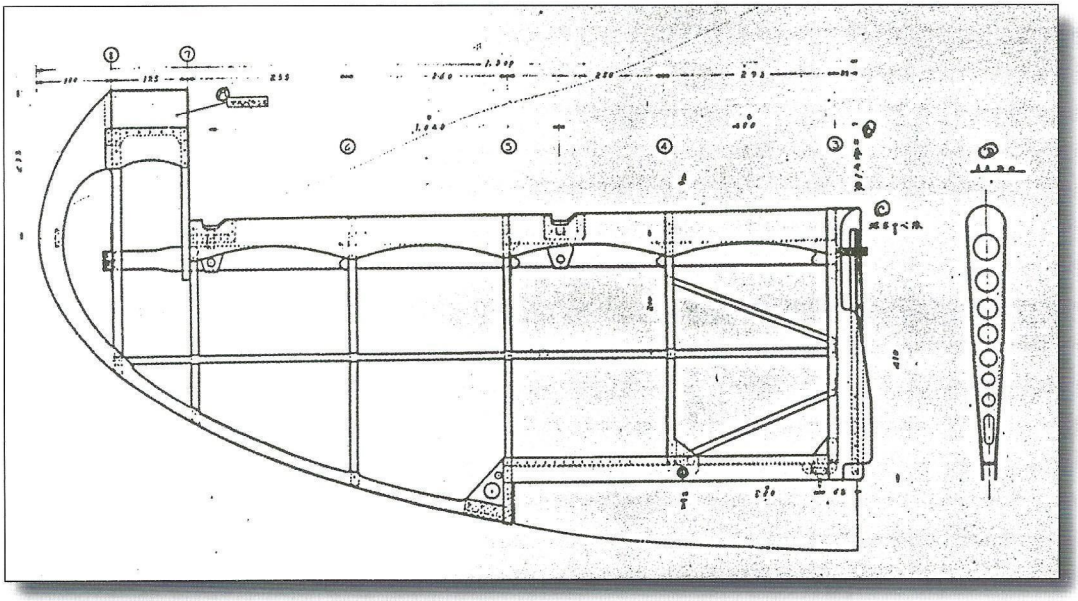
オーシ＼小骨		①	②	③	④-⑮	⑯	⑰	⑱	⑲	⑳	㉑
H		上16.56	〃	〃	上16.56	上9.0	上1.0	下10.5	下20.5		
R1		387	〃	〃	387	37.5	36	32	27		
1/8	上	52.1	〃	〃	52.1	48.5	40.5	26.5	10	1.0	
	下	24.02	〃	〃	24.02	25.5	31.5	40	46.5	44	
1/4	上	69.26	〃	〃	69.26	65.0	57	42	25.5	13	
	下	35.1	〃	〃	35.1	36.0	39	46.5	52.5	50	
1/2	上	91.88	〃	〃	91.88	88.5	79.5	65.5	47	32.5	
	下	47.42	〃	〃	47.42	48.8	51	55	61	56	
3/4	上	107.8	〃	〃	107.8	105.0	95	81	63	48.5	16
	下	56.32	〃	〃	56.32	57.5	59	61.5	65.5	59.5	33.5
1	上	119.18	〃	〃	119.18	116.5	107	93	75.5	61.5	28.5
	下	63.8	〃	〃	63.8	64.7	65	66	68.5	61.5	38
1½	上	132.91	〃	〃	132.91	130	122.5	109.5	94.5	78.2	45
	下	75.5	〃	〃	75.5	75.5	73.2	71	69.5	63.5	41
2	上	139.15	〃	〃	139.15	136	130	119	106	88	56
	下	84.4	〃	〃	84.4	82.8	79.5	75	70	62.5	41.5
2½	上	141.65	〃	〃	141.65	139	133.5	124	111.5	93	57.5
	下	90.17	〃	〃	90.17	87.2	84	77.5	70	61	40.5
3	上	145	142.5	141.5	141.18	139.5	135	125.5	113	94	60
	下	92.98	〃	〃	92.98	90.5	86.8	79	70	59	39
4	上	145	138	135	134.0	132	128	121	109	90.5	55
	下	92.35	〃	〃	92.35	90.89	86.54	78.78	67.3	55	37
5	上	142	128	123	120.14	119	115	109	98	79.5	45.5
	下	85.8	〃	〃	85.8	84.37	80.33	73.13	62.48	50	31.5
6	上	135.5	113.5	106.5	103.12	101.3	97.5	92.5	83.6	66	32
	下	75.04	〃	〃	75.04	73.89	70.35	64.04	54.72	42.5	23.5
7	上	127	95.5	86.5	81.9	81	78.2	74.5	66.3	50	13
	下	56	59	60	61.0	60.6	57.19	52.06	44.49	33.5	11.5
8	上	115	75	63.5	58.19	57.7	55.5	52.5	47.5	31.5	
	下	24	39	41.5	44.15	43.46	41.38	37.67	32.18	22	
9	上	100.5	54	39	31.82	31.5	30	27.5	25.8	11	
	下	-22.5	12	20	24.8	24.42	23.25	21.6	18.98	9	
9½	上	92	44	27	17.47	17.4	16.8	15.2	14.8		
	下	-49.5	-6.5	7	14.04	13.83	13.16	11.98	10.24		
k		±80	±30.5	±10.5							
K2		32	〃	〃	〃	〃	〃	〃	32		

主翼断面線畫

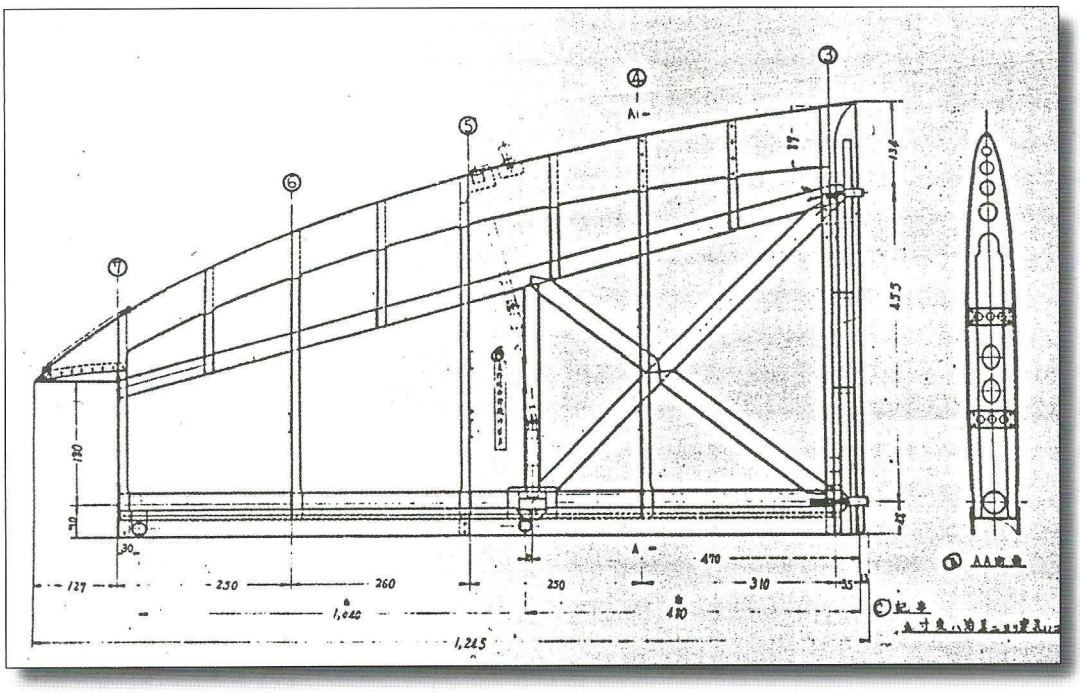
Ventral fin construction.

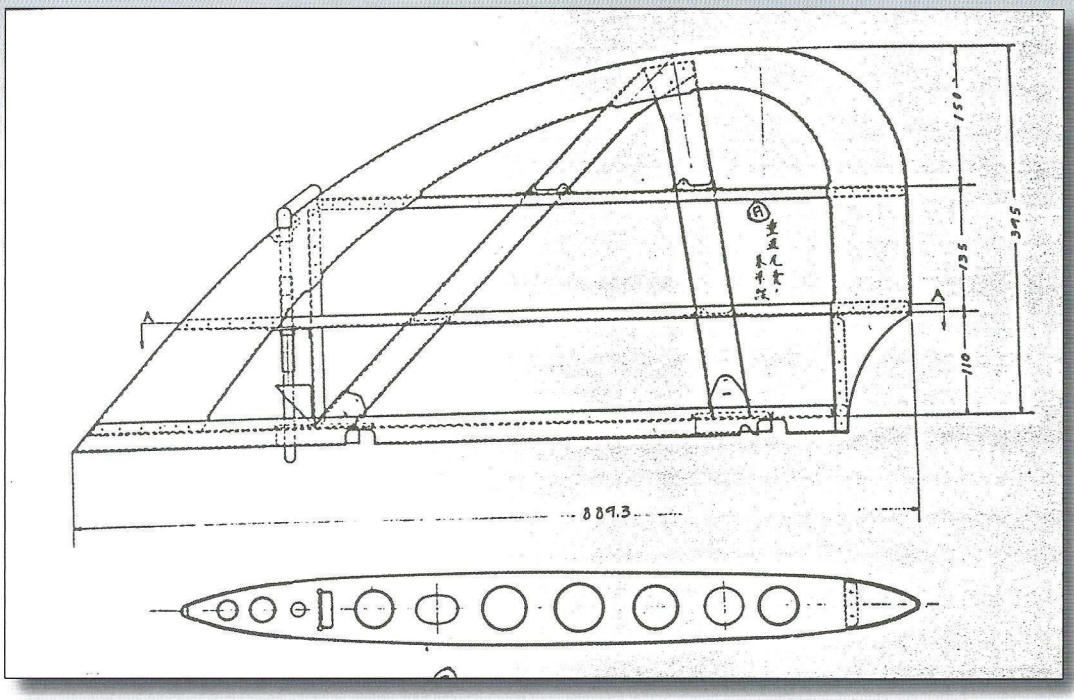


Elevator construction.

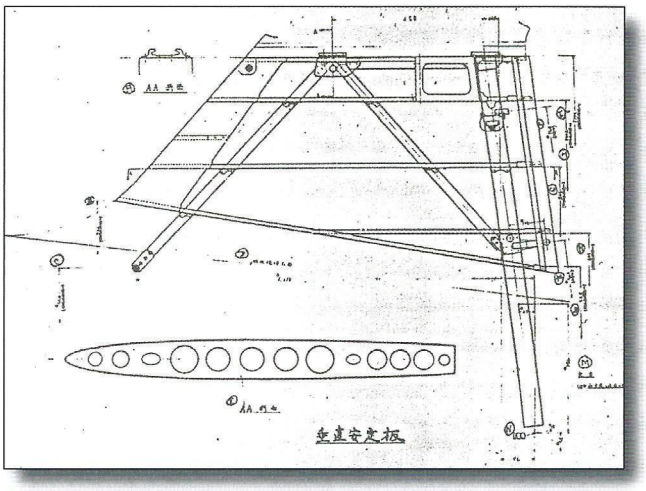


Horizontal stabilizer construction.





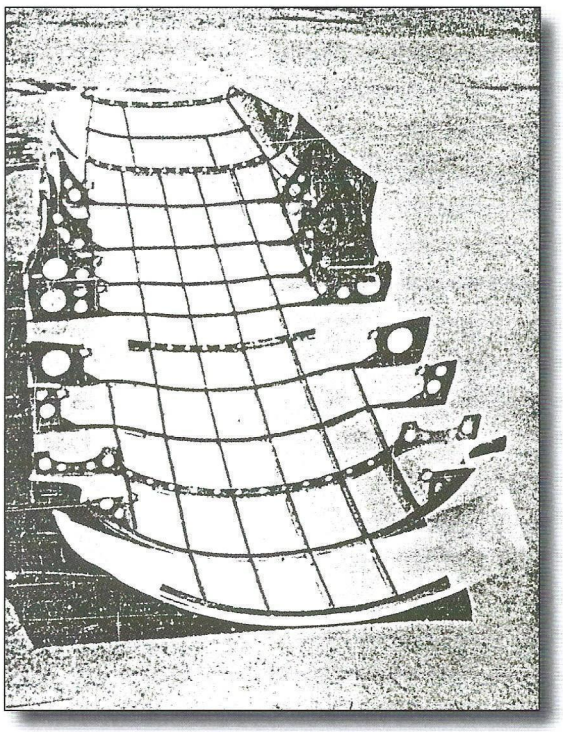
Top fin construction.

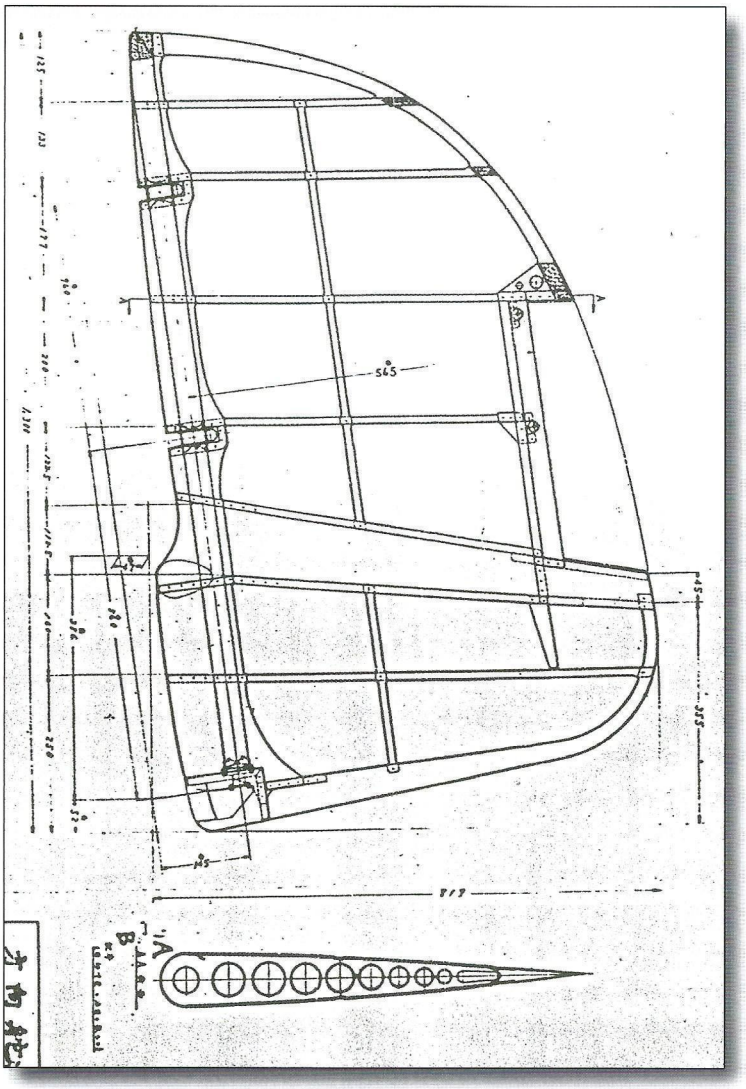


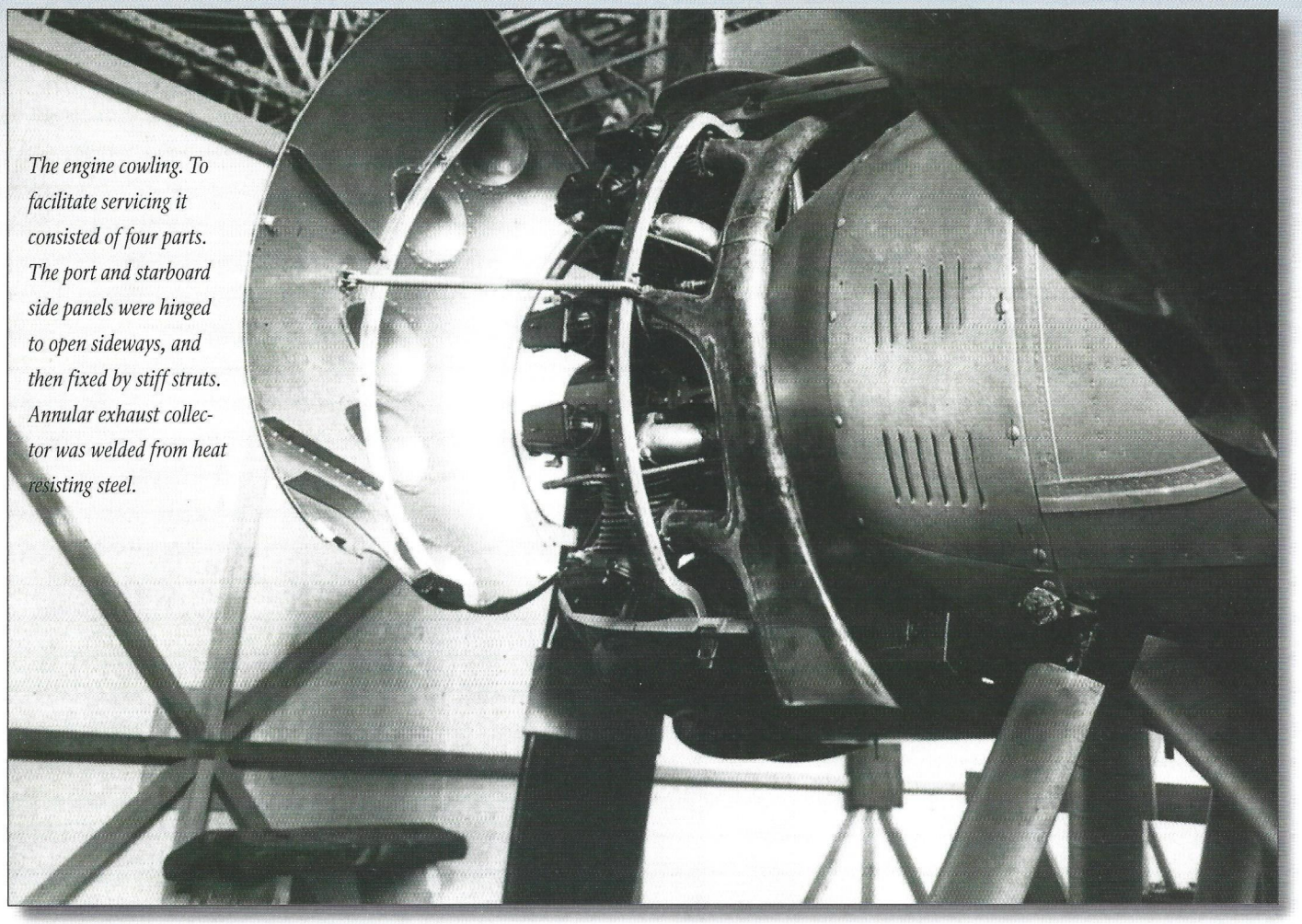
Left: *Vertical fin construction.*

Below: *Rudder construction.*

Bottom, left: *Outer panel of the rear fuselage underside. Note that is curved.*



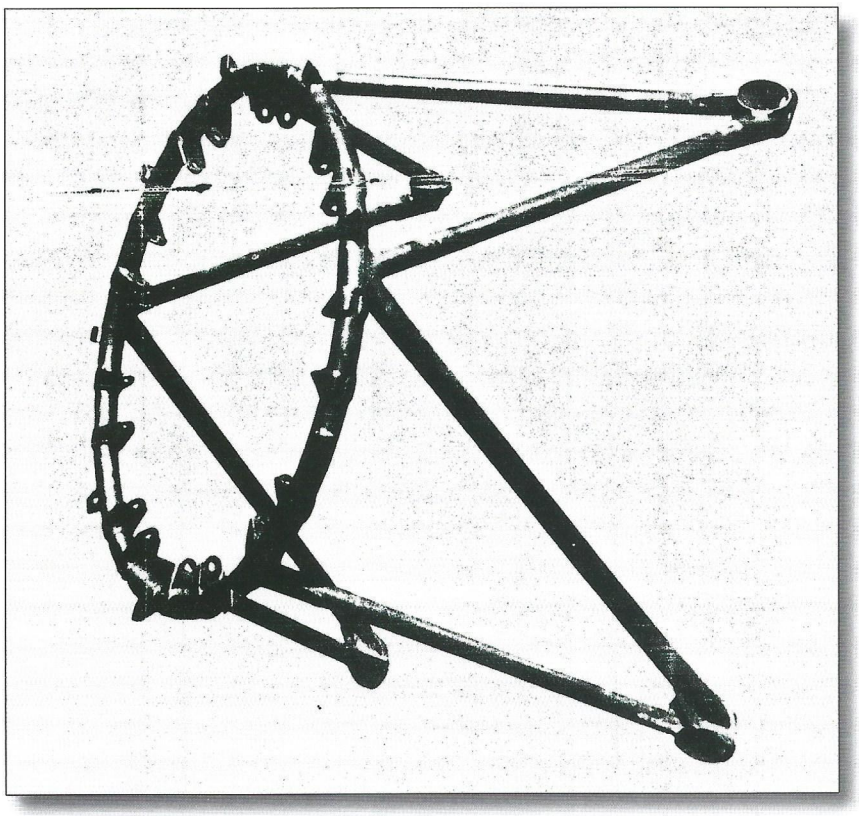




The engine cowling. To facilitate servicing it consisted of four parts. The port and starboard side panels were hinged to open sideways, and then fixed by stiff struts. Annular exhaust collector was welded from heat resisting steel.

Below: Engine mount.

Due to small available area on the deck of the submarine, the engine cowling was four-piece (of which two were opening). The engine's exhausts were connected to an annular collector. To minimise the size of the engine cowling individual valve rocker fairings were used.

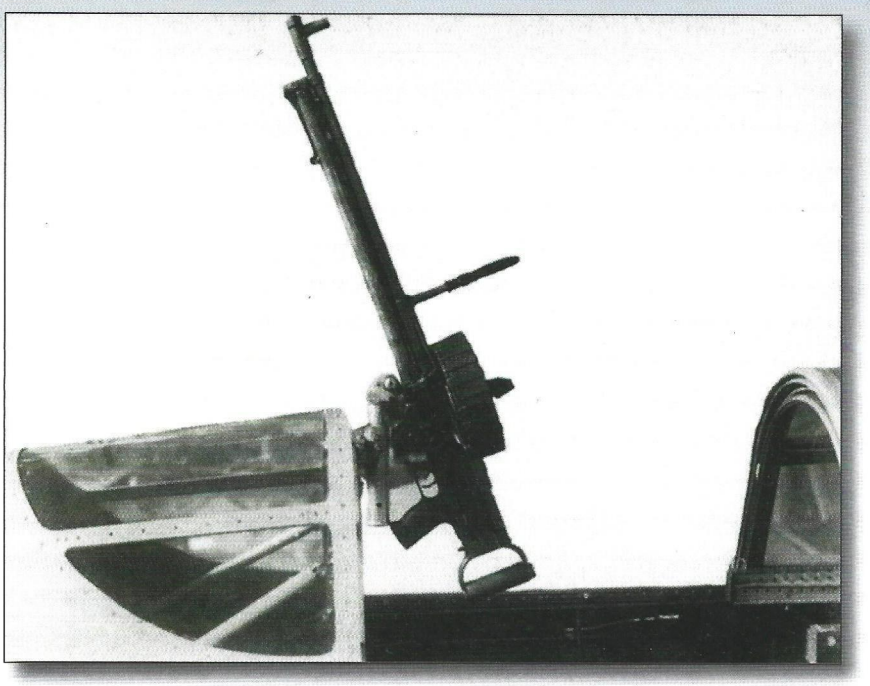


The E14Y1 was armed with a flexible Type 92 7.7 mm (0.303 in.) machine gun. This was attached to a frame in the rear cockpit aft of the observer's seat. Its operation system was very simple: when not in use it was disconnected and stored on the floor, to the right-hand side of the observer's cockpit. Three ammunition drums or a bag contained 291 standard rounds. However, considering the performance and minimal defensive armament, the E14Y1 had virtually no chance in case of an encounter with enemy fighters. Therefore, very often the gun was not carried at all during sorties. Racks for two 30 or 60 kg bombs were fitted under the wings (see next section).

Designation: 7.7 mm machine gun Type 92 Model 2
Muzzle velocity: 748 m/s
Firing rate: 550 rounds/min
Weight: 9.45 kg

Length: 0.98 m
Magazine: drum type, 97 rounds

Reconnaissance equipment: E14Y1 seaplanes had no special reconnaissance equipment, and the only 'reconnaissance device' they had were the two pairs of eyes of their crew members.



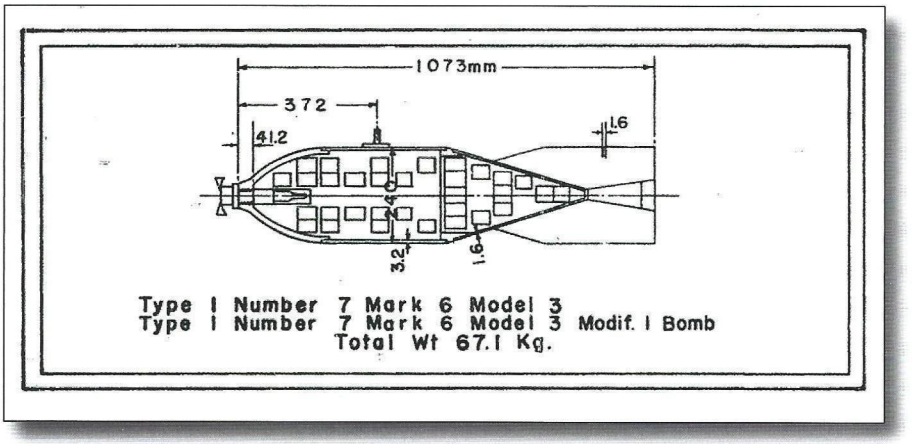
Type 92 Model 2 7.7 mm (0.303 in.) machine gun mounted in the rear cockpit. It was usually stored inside the rear cockpit.

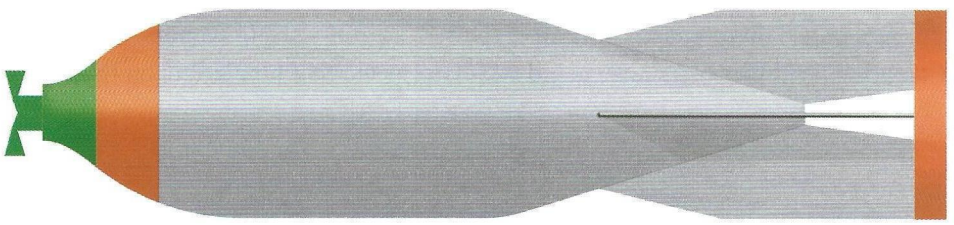
Bombing equipment: Originally submarine-based seaplanes were designed only for reconnaissance missions, and due to the relatively low-power engine were devoid of any bomb equipment. For this reason bomb racks were not originally installed on E14Y1s. In July 1942, for the purpose of the planned air raid against Oregon, one E14Y1 was to be equipped with special bombs. Lt Shojiro Iura from the *Gunreibu Socho* (IJN HQ) and Cpt Shunji Kamide from the *Kaigun Koku Hombu* (IJN Air Service HQ) with assistance of the Kugisho arsenal installed bomb racks in the E14Y1 based on the submarine *I-25*. The bomb developed for the mission wore the designation *1 Shiki 7 Ban 6 Go 3 Gata bakuden* (Type 1 Number 7 Version 6 Model 3 bomb).

The bomb was a new design developed and built in 1941. Series production was ordered in 1942. The body contained 520 incendiary balls, which were scattered when the bomb exploded, over a range of 80 m and burned for about 20 s. *I-25* was supplied with six such bombs, which were to be dropped during the missions over Oregon. Four of them were dropped by Nobuo Fujita during his two sorties.

Cutaway of 1 Shiki 7 Ban 6 Go 3 Gata *Bakudan bomb.*

Designation: *1 Shiki 7 Ban 6 Go 3 Gata bakuden*
Development: designed 1941, series production 1942
Length: 1,073 mm
Diameter: 240 mm
Weight: 67.1 kg
Filling weight: 30 kg
Fuse: Type 97 Version 2 Model 2 Modification 1, front fuse





The colors of 1 Shiki 7 Ban 6 Go 3 Gata *bakudan (green, red on light grey) incendiary bomb.*

Caution: The bomb body was identical to the Type 99 Number 6 Version 2 bomb.

Colouring: light grey overall, fuse green, front red, stabilisers and their struts red - the distinctive feature of this bomb type.

In 1943 the E14Y1 was modified for carrying *99 Shiki 5 Ban tsujyo bakudan 1 Gata* bombs (Type 99 Number 6 Model 1 general purpose bomb) as standard equipment. Maximum take-off weight of the E14Y1 with bombs rose to 1,750 kg. Because strengthening of the wing struts was impossible, the aircraft manual issued on 5th June 1943 was supplemented with the following remarks:

1. Do not alight on the water with bombs on racks,
2. Take-off from still water only,
3. Limit the acceleration during take-off from the catapult to 2.8G,
4. Fly with special care and carefully watch the sky.

Except for the bomb raid by Nobuo Fujita there are no other reports concerning similar raids. There are no photographs of E14Y1s with visible bomb racks, thus, there is no credible information about the location and appearance of these racks. In the photo of E14Y1 (code 671-05), *on page 60*, can be seen a bomb rack shape under its left wing.

In January 1944 at the Penang naval base the E14Y1 based on *I-37* was equipped with bomb racks. The racks were installed at the request of the submarine's CO as well as of seaplane pilot Ens. Kazuo Takahashi. Three aviation mechanics from Singapore made suitable modifications to the seaplane within a week. Takahashi wished to have two underwing bomb racks, however, due to the insufficient strength of the wings only one rack for a 60-kg bomb was installed under the fuselage.

On 10th February 1944 the submarine *I-37* carried out a reconnaissance mission around the Chagos Archipelago, Diego Suarez and Mombasa, having three 60-kg bombs aboard. On 3rd March 1944 Takahashi took-off with one 60-kg bomb for the mission over Chagos Archipelago. He was unable to find any enemy ship and returned to *I-37*, dropping the bomb into the ocean before landing.

Designation: *99 Shiki 5 Ban tsujyo bakudan 1 Gata*
Application: against sea surface targets,
Development: designed 1938, production 1939, used until the end of the war,
Length: 1,144 mm
Diameter: 226 mm
Weight: 62.8 kg
Filling weight: 30 kg
Fuse: Type 97 Version 2 Model 2, front fuse

It could pierce 25 mm thick armour. From 12th January 1944 the bomb wore the IJA Air Service designation 4 Shiki 60 kg taikan bakudan (Type 4 60 kg anti-warship bomb).

Colouring: light grey overall, front and stabilisers green; thin blue stripes on the body.

Specifications:

Description: single-engine reconnaissance seaplane for submarines. Mixed construction, partly fabric covered.

Crew: pilot and observer/gunner in a semi-enclosed cockpit (prototype) or in fully enclosed cockpit (E14Y1 Model 11).

Power plant: one Hitachi GK2 *Tempu* 12 (Ha-22-12) 9-cylinder air cooled radial rated at 340 hp (250 kW) for take-off and at 300 hp (220 kW) at 2,000 m; wooden two-blade fixed pitch propeller 2.5 m in dia.; fuel tank capacity 200 l (1st and 2nd prototype) or 340 l (E14Y1 Model 11), oil tank capacity 26 (31) l.

Armament: one 7.7 mm (0.303 in.) Type 92 machine gun in the observer's cockpit.

Bomb load: two 30 kg bombs (during the Oregon raid two 77 kg phosphorus incendiary bombs).

Type	E14Y1 (prototype)	E14Y1 Model 11
Dimensions		
Wing span, m	10.966	10.966
Length, m	8.538	8.538
Height, m		3.685
Wing area, m^2	19.00	19.00
Weights		
Empty weight, kg	1,130	1,085
Take-off weight, normal, kg	1,530	1,450
Take-off weight, max. kg	1,600	1,750
Useful load, kg	400	365
Wing loading, kg/m^2	80.52	76.32
Power loading kg/hp	4.50	4.27
Performance		
Maximum speed, km/h at an altitude of 0 m	239	246
Cruising speed km/h	157	167
at an altitude of m	1,000	1,000
Landing speed, km/h	89	92
Time of climb to 3,000 m	10'11"	10'11"
Service ceiling m	5,420	6,000
Normal range km	650	880
Maximum range km	880	980
Endurance		
at an altitude of 3,000 m	5.6h	5.9h

Production: A total of 138 E14Y1 seaplanes was built, including:

Dai-Ichi Kaigun Koku Gijyutsusho at Yokosuka:

2 – E14Y1 prototypes (1939),

Kabushiki Gaisha Watanabe Tekkosho at Zasshonokuma:

10 – E14Y1 Model 11 – pre-production series (1940)

126 – E14Y1 Model 11 – series production (1941-1943)

Submarines equipped with reconnaissance seaplanes

Submarine *I-5*, J 1 M class.

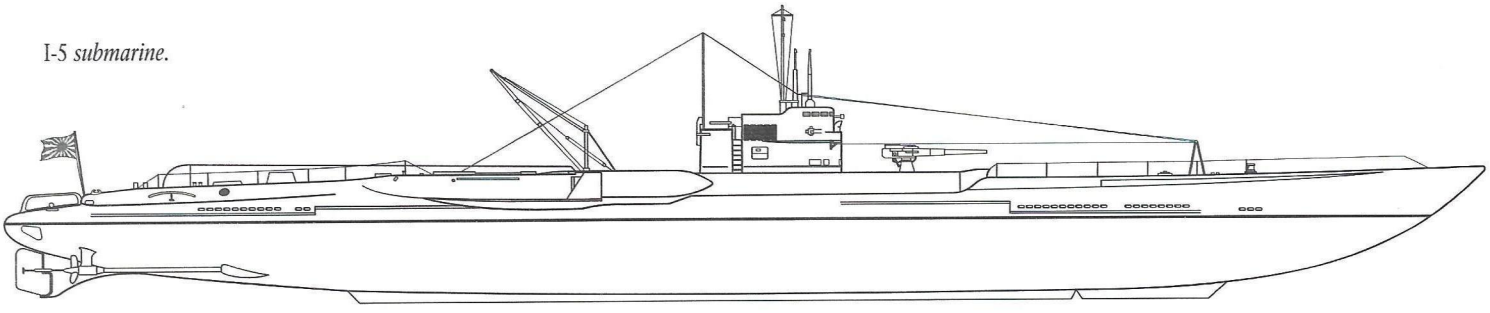
It was built according to a project of the Navy Technical Institute, based on the *Jun Sen* J1 boats, but as a seaplane carrier. Construction started by Kawasaki shipyard in Kobe in October 1929, entered service on 31st July 1932. Partial double hull with seven compartments and three sets of main ballast tanks, with fuel tanks for 160 tonnes of diesel fuel and 12 tonnes of aircraft petrol inside the pressure hull. Aircraft equipment consisted of two watertight hangars 9.15 m long and 2.75 m in diameter, located on both sides on the conning tower, partly within the hull contour, pneumatic catapult (from 1933) and folded crane.

Kure Type 1 Model 3 catapult: rail track 1.2 m, full take-off run length 19.4 m, operating length 15.4 m, take-off speed 26 m/s, acceleration 2.5g.

To compensate for the weight of the aircraft equipment on board, all six torpedo launchers with spare torpedoes were located in the bow (in J1 class submarines two out of six torpedo launchers were located in the stern). Moreover, when fitting the catapult the stern armament was removed, and the bow gun was replaced with a gun of the same calibre but on a lighter mount to maintain balance.

Launching date	19th June 1931
Displacement, surfaced	2,243 tons
Displacement, submerged	2,921 tons
Power plant	two diesel engines with a combined rating of 6,000 hp (4,410 kW), two electric motors with a combined rating of 2,600 hp (1,910 kW)
Length	97.5 m
Width	9.2 m
Maximum speed	18 knots on the surface
Range	24,000 miles with average speed of 10 knots
Armament	six 533 mm (21 in.) torpedo launchers with a reserve of 20 torpedoes, two (then one) 140 mm guns, one reconnaissance seaplane.

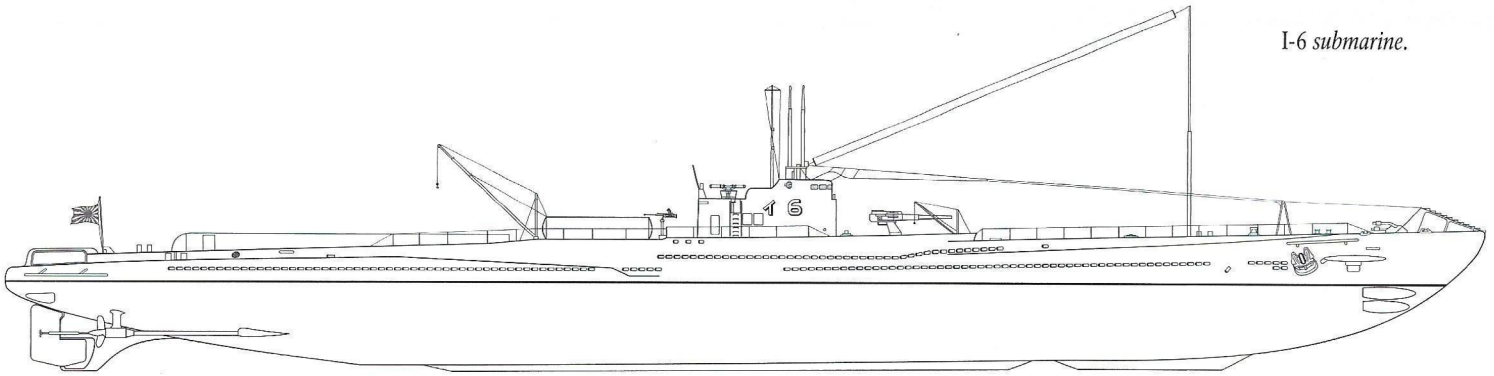
I-5 *submarine.*



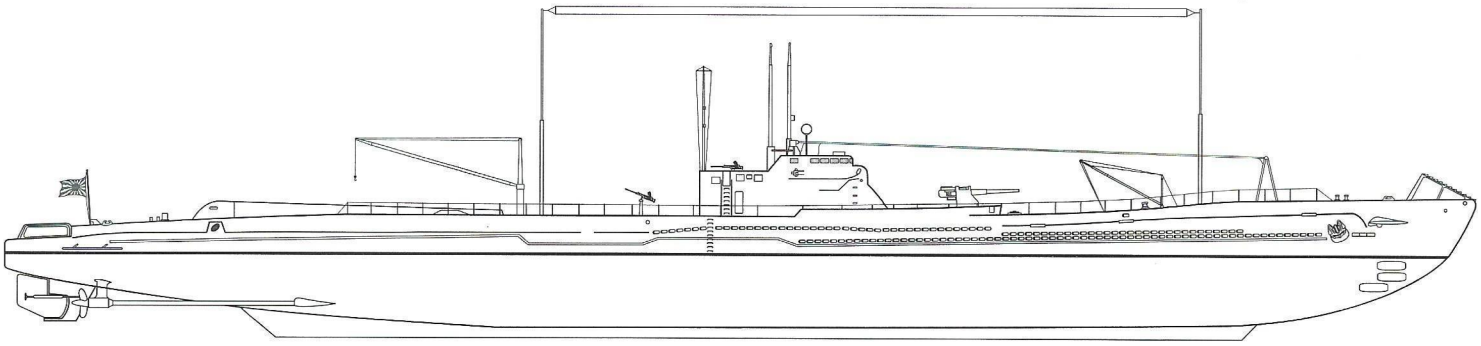
Submarine *I-6* J2 class

Launching date	31st March 1934
Displacement, surfaced	2,243 tons
Displacement, submerged	3,061 tons
Power plant	two diesel engines with a combined rating of 8,000 hp (5,880 kW), two electric motors with a combined rating of 2,600 hp (1,910 kW)
Length	98.5 m

Width	9.0 m
Maximum speed	20 knots on the surface
Range	20,000 miles with average speed of 10 knots
Armament	six 533 mm (21 in.) torpedo launchers with a reserve of 17 torpedoes, one 127 mm (5 in.) gun and one 13 mm anti-aircraft machine gun, one reconnaissance seaplane.



I-6 *submarine.*



I-7 *submarine.*

Submarines *I-7* and *I-8*, J3 class

Submarine cruisers, developed for more range and endurance. Compared to the J1 and J2 class the hull of the J3 class was stretched by 10.8 m. Moreover, more equipment was fitted, as were more powerful diesel engines and electric motors. Surface speed reached 23 knots, submerged speed was virtually unchanged. Design type: double hull. The main boat, *I-7*, built by Kure Navy Yard, keel laid on 12th September 1934, launched 3rd July 1935, entered service on 31st March 1937. *I-8* was built by the Kawasaki shipyard at Kobe (keel laid on 11th October 1934, launched on 20th July 1936, entered service on 5th December 1938). To retain the stern position of the hangar and aircraft take-off complex, according to unconfirmed information, two deck cylindrical hangars were replaced after another modification with a single watertight hangar entirely within the hull contour. These submarines introduced the E9W1 reconnaissance seaplanes into service.

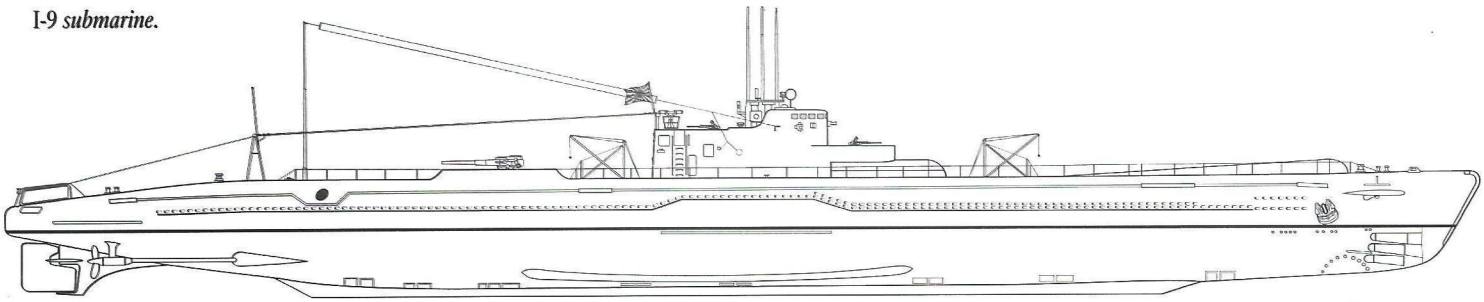
Launching date	3rd July 1935, 20th July 1936
Displacement, surfaced	2,525 tons
Displacement, submerged	3,583 tons
Power plant	two diesel engines with a combined rating of 11,200 hp (8,235 kW), two electric motors with a combined rating of 2,800 hp (2,060 kW)
Length	109.3 m
Width	9.0 m
Maximum speed	23 knots on the surface
Range	14,000 miles with average speed of 16 knots
Armament	six 533 mm (21 in.) torpedo launchers with a reserve of 20 torpedoes, one 140 mm gun and one anti-aircraft machine gun 13 mm, one reconnaissance seaplane.

Submarines *I-9* to *I-11*, *Ko 1-Go* class

Submarines *I-9*, *I-10*, and *I-11* were built as submarine squadron flagships, but with the additional role of forwarding radio signals received from the Navy General Staff to units in the entire Pacific war theatre (in the future this project was followed in construction of special relay ships, *Ko 2-Go* class). The main boat, *I-9*, was built at Kure (keel laid in January 1938, entered service on 13th February 1941). *I-10* and *I-11* were built by Kawasaki shipyard at Kobe. Keels laid in June 1938 and April 1940, entered service in October 1941 and May 1942, respectively. Compared to the basic J3 class they were longer and had reshaped hulls.

Launching date	20th May 1939, 20th September 1939 and 28th February 1941
Displacement, surfaced	2,912 tons
Displacement, submerged	4,149 tons
Power plant	two diesel engines with a combined rating of 12,400 hp (9,120 kW), two electric motors with a combined rating of 2,400 hp (1,765 kW)
Length	113.7 m
Width	9.5 m
Maximum speed	23.5 knots on the surface
Range	14,000 miles with average speed of 16 knots
Armament	six 533 mm (21 in.) torpedo launchers with a reserve of 20 torpedoes, one 140 mm gun and one 25 mm anti-aircraft gun, one reconnaissance seaplane.

I-9 *submarine.*



***I-12* (class *Ko 2-Go*)**

Launching date	3rd August 1943
Displacement, surfaced	2,934 tons
Displacement, submerged	4,172 tons
Power plant	two diesel engines with a combined rating of 4,700 hp (3,455 kW), two electric motors with a combined rating of 1,200 hp (880 kW)
Length	113.7 m
Width	9.5 m
Maximum speed	18 knots on the surface
Range	22,000 miles with average speed of 16 knots
Armament	six 533 mm (21 in.) torpedo launchers with a reserve of 18 torpedoes, one 140 mm gun and one 25 mm anti-aircraft gun, one small reconnaissance seaplane.

Submarines *I-15* – *I-39*, *Otsu 1-Go* class

These were the last submarine cruisers designed before war broke out in the Pacific. A total of 20 boats were built in the class, of which seven were before the war (*I-15*, *I-17*, *I-19*, *I-21*, *I-23*, *I-25*, and *I-26*). They were built in Navy shipyards at Kure, Sasebo and Yokosuka, and in Kawasaki and Mitsubishi shipyards at Kobe. Keel for the first submarine *I-15* in the series was laid in January

1938, and she entered service in 30th September 1940. Construction of the last submarine, *I-39*, commenced in June 1941, and she entered service on 22nd April 1943. Design type: double hull. The hangar and catapult system was initially located ahead of the bridge, significantly improving catapult launch conditions for the seaplane, which could take off at a top speed. These submarine cruisers became the foundation of the Japanese submarine fleet.

Launching date	20 vessels launched 7th March 1939 to 15th April 1942
Displacement, surfaced	2,584 tons
Displacement, submerged	3,654 tons
Power plant	two diesel engines with a combined rating of 11,000 hp (8,090 kW), two electric motors with a combined rating of 2,400 hp (1,765 kW)
Length	108.7 m
Width	9.5 m
Maximum speed	23.5 knots on the surface
Range	14,000 miles with average speed of 16 knots
Armament	six 533 mm (21 in.) torpedo launchers with a reserve of 20 torpedoes, one 140 mm gun and one 25 mm anti-aircraft gun, one reconnaissance seaplane.

I-40 and *I-45* (*Otsu 2-Go* class)

Launching date	6 vessels launched 25th October 1942 to 6th March 1943
Displacement, surfaced	2,624 tons
Displacement, submerged	3,700 tons
Power plant	two diesel engines with a combined rating of 11,000 hp (8,090 kW), two electric motors with a combined rating of 2,000 hp (1,470 kW)
Length	108.7 m
Width	9.5 m
Maximum speed	23.5 knots on the surface
Range	14,000 miles with average speed of 16 knots
Armament	six 533 mm (21 in.) torpedo launchers with a reserve of 20 torpedoes, one 140 mm gun and one 25 mm anti-aircraft gun, one small reconnaissance seaplane.

I-54, I-56 and *I-58* (*Otsu 3-Go* and *Otsu 4-Go* class)

Launching date	4th May, 30th June and 9th October 1943
Displacement, surfaced	2,607 tons
Displacement, submerged	3,688 tons
Power plant	two diesel engines with a combined rating of 4,700 hp (3,455 kW), two electric motors with a combined rating of 1,200 hp (880 kW)
Length	108.7 m
Width	9.3 m
Maximum speed	17.75 knots on the surface
Range	21,000 miles with average speed of 16 knots
Armament	six 533 mm (21 in.) torpedo launchers with a reserve of 19 torpedoes, one 140 mm gun and one 25 mm anti-aircraft gun, one reconnaissance seaplane.

Class	J1M	J2	J3	Otsu 1-Go	Ko 1-Go
Number of ships in the class	1	1	2	20	3
Ships in service prior to 7th December 1941	*I-5*	*I-6*	*I-7, I-8*	*I-15, I-17, I-19, I-21, I-23, I-25, I-26*	*I-9, I-10*
Entry into service of the first submarine in the class	1931.07.31	1935.05.15	1937.03.31	1940.09.30	1941.02.13
Displacement, surfaced, t	2,243	2,243	2,525	2,584	2,434
Displacement, submerged, t	2,921	3,061	3,585	3,654	4,149
Hull length, m	97.5	98.5	109.3	108.7	113.7
Hull width, m	9.2	9.0	9.0	9.3	9.5
Average draught, m	5.0	5.8	5.2	5.15	5.3
Reserve buoyancy, %	23.5	26.7	29.5	29.2	29.6
Operating depth, m	80	80	100	100	100
Cruising endurance, days	60	80	90	90	90
Number of screw propellers	2	2	2	2	2
Engine power:					
- Diesel, hp	2 x 3,000	2 x 4,000	2 x 5,600	2 x 6,200	2 x 6,200
- electric, kW	2 x 735	2 x 735	2 x 1,030	2 x 880	2 x 880
Fuel capacity, t					
- Diesel	160	190	230	220	220
- aircraft petrol	12	29	35	35	35
Maximum speed, knots					
- surfaced,	8.0	7.5	7.8	8.0	8.0
- submerged,	18.2	20.1	23.0	23.6	23.5
Range/speed, miles/knots					
- surfaced,	24,000/10	20,000/10	14,000/16	14,000/16	14,000/16
- submerged	60/3	60/3	60/3	96/3	60/3
Torpedo armament:					
- number x caliber (mm) stern	6 x 533	4 x 533	6 x 533	6 x 533	6 x 533
- number x caliber (mm) bow	-	2 x 533	-	-	-
Gun armament:					
- number x caliber (mm) deck	2 x 140	1 x 127	1 x 140	1 x 140	1 x 140
- number x caliber (mm) anti-aircraft	1 x 7.7	2 x 13.2	2 x 13.2	2 x 25	2 x (2x25)
Aircraft equipment:					
- number x type of aircraft	1 x E6Y1*	1 x E6Y1*	1x E9W1**	1 x E9W1**	1x E9W1**
- number x type of hangar	2x watertight	2x watertight	1x watertight	1 x watertight	1x watertight
Crew	68	68	80	94	100

* – from 1936 – E9W1

** – from 1942 – E14Y1

The E14Y "Glen" wrecks of the *Akibasan Maru*

By Dan Farnham

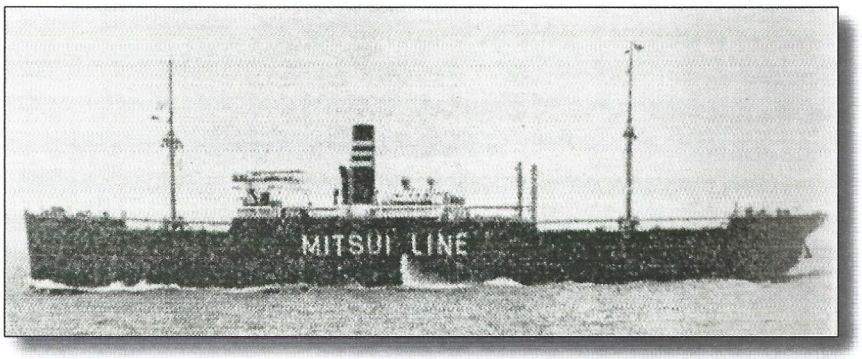
Located in the Central Pacific Ocean, the Marshall Islands is a group of 29 atolls and five separate islands. The largest of the atolls, Kwajalein, lies approximately 2,100 miles southwest of Hawaii. Kwajalein Atoll is comprised of 97 islets on a crescent-shaped reef that is 112 miles in diameter. The reef encloses the world's largest natural lagoon, with a surface area of approximately 1,100 square miles. Kwajalein island is the southern-most and largest island of the atoll that bears its name. Kwajalein island is 2 ½ miles long, and at its widest is only 800 yards. From 1939 until 1944, the island was the headquarters for the Japanese 4th Submarine Fleet and the 6th Base Force.

The *Akibasan Maru* was a 4,000-ton Japanese cargo ship which was anchored at the Kwajalein island anchorage on January 30, 1944, after arriving from Truk. On that date, the ship came under attack, along with several other ships in the anchorage, by American carrier aircraft of TG 58.1 and 58.2 during pre-invasion attacks on the atoll. The pilots of the attacking planes reported one direct hit on the stern, one hit on the starboard side amidships, and one hit on the bow forward of the bridge. The ship was left burning and smoking, settling by the stern and listing to starboard. A Japanese stevedore who was captured later off Kwajalein, and who was on the ship at the time of the attack, said that the ship sank within five minutes after being hit.

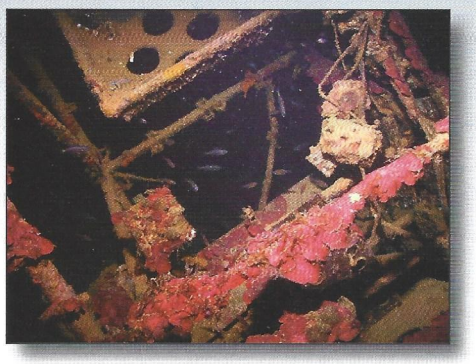
The *Akibasan Maru* came to rest on a 160 foot bottom, resting against two coral heads, and with her bow facing northeast. The ship lies about 500 yards from the north end of Kwajalein island, on the lagoon side. It was found for the first time in 1965, and due to its close proximity to the Small Boat Marina on Kwajalein, it is one of the more popular wrecks to visit in the lagoon. A mooring cable is attached to the wreck, just forward of the No.5 cargo hold near the stern, and runs to a surface buoy. A leader at the surface buoy provides an easy mooring line for dive boats. Kwajalein divers refer to this shipwreck as the "P-buoy wreck".

In mid-March of 2008, I was talking about plane wrecks with Gordon Jones. Gordon is a long-time Kwajalein resident and diver, and is very knowledgeable about the various wrecks in the lagoon. Gordon told me that there was a pair of wings, and the remains of two fuselages, on the wreck of the Akibasan Maru. He explained that the wings were in cargo hold 1, and the fuselages were in cargo hold 2. Hal Parker, another long-time Kwajalein resident and diver, also mentioned the wings in cargo hold 1. This information of course stirred my interest in diving to the wreck to see the remains for myself.

My first dive of the wreck was just a few days later, on 28th March. Three of my friends and fellow Kwajalein divers, Mike Woundy, Ryan Vahle, and Stewart Bell, accompanied me on this dive. We swam forward to cargo hold 1, and I dropped into the hold until I was even with the first level below the main deck. Right there in front of me, leaning against the starboard side of the hold, were the wings that Gordon and Hal had told me about. Since only the framework remains, my immediate impression was that the wings had once been fabric-covered. I shot several pictures, and later that day I posted them on the J-aircraft.com BBS. The identification of the wings was quickly made by Jim Lansdale and Jim Long – these wings belonged to a Kugisho E14Y "Glen".



Akibasan Maru *(4,000-ton, Mitsui Bussan Shipbuilding).*



Pilot's seat.

I shared this information with Gordon and Hal the next day, and Gordon asked me if I had seen the fuselages and floats in cargo hold 2. I had not, and on 6th April, I went back down to the wreck. Mike and Stewart accompanied me on this dive as well. I found several floats on level 1 of cargo hold 5, and one float is close enough to the deck edge to be photographed. A white band with kanji lettering is still visible on that float, and I was able to get several close-up shots of it using the zoom on my camera. Again, I posted the photos on the J-aircraft.com BBS after the dive, and the floats were quickly identified as belonging to an E14Y. The kanji translates to "dolly", and from looking at a drawing and a WWII-era picture on J-aircraft.com, it is a marker for positioning the beaching dolly.

My next dive into cargo hold 2 was on 14th April, in company with Chris LeBlanc. On that dive I shot several pictures of the fuselage remains at the bottom of the well. One fuselage lies on its left side, and the other is leaning partially upright. A lot of debris is mixed in with the fuselages, and photography of the remains is difficult as a result. After posting the images on the J-aircraft.com BBS, Jesse Belding identified what turned out to be one of the horizontal stabilizers that is lying on top of the fuselage on its side.

Positive identification of the fuselage remains would prove to be a challenge in the coming weeks. Due to the depth of the fuselages in the hold, I knew it would take several dives to completely photograph the fuselage remains.

Another friend and fellow Kwajalein diver, Al Christ, told me around that time that he had seen a set of wings on level 1 of cargo hold 6. On my next dive of the wreck, on 17th April, I took a look, and sure enough, there is a pair of E14Y1 wings lying flat on the port side of the first level of the cargo hold. I didn't need to post the pictures I shot for identification, as I could tell as soon as I saw them, that they are identical to the wings in cargo hold 1. However, I again posted the images on the J-aircraft.com BBS for positive identification, and my analysis was confirmed.

After a total of 26 dives on the wreck to photograph the aircraft components, the identifications had been made – there are wings, fuselages, and floats for two E14Ys. These are the only two E14Ys that have been found anywhere in the world since World War II. The discovery of these wrecks fills a significant part in WWII aviation and submarine history. For safety reasons, no penetration diving is allowed on any wreck at Kwajalein Atoll. (***Author's note:*** these two E14Y1s were for *Dai 6 Sensuikan Kichi tai* (6th Submarine Base Unit) in Kwajalein.)

Fuselage #2 at the bottom of cargo hold #2, with the tail section lying on top.

A special thanks to the following Kwajalein divers who assisted me with the underwater portion of this project – Gordon Jones, Hal Parker, Al Christ, Mike Woundy, Jeff Timmerman, John Hadley, Marty Bazar, Chris LeBlanc, Melissa Oliver, Misty Fischer, Ryan Vahle, Stewart Bell.

Pilot's cockpit of fuselage #1, with a E14Y float in the background.

Back of the pilot's seat in fuselage #2, seen from the observer's cockpit.

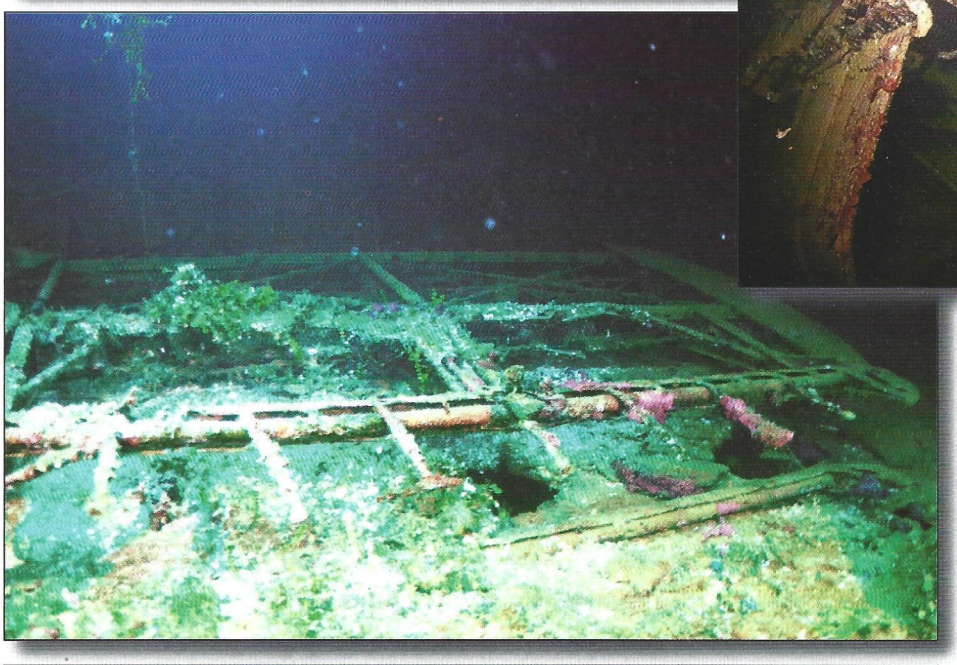
Fuselage #1, bottom left and underside of fuselage #2.

E14Y wings on the starboard side of cargo hold #1. The right wing is in front and the left wing is behind it.

Close-ups of the wing framework

***Below:** E14Y wings on the port side of cargo hold #5.*

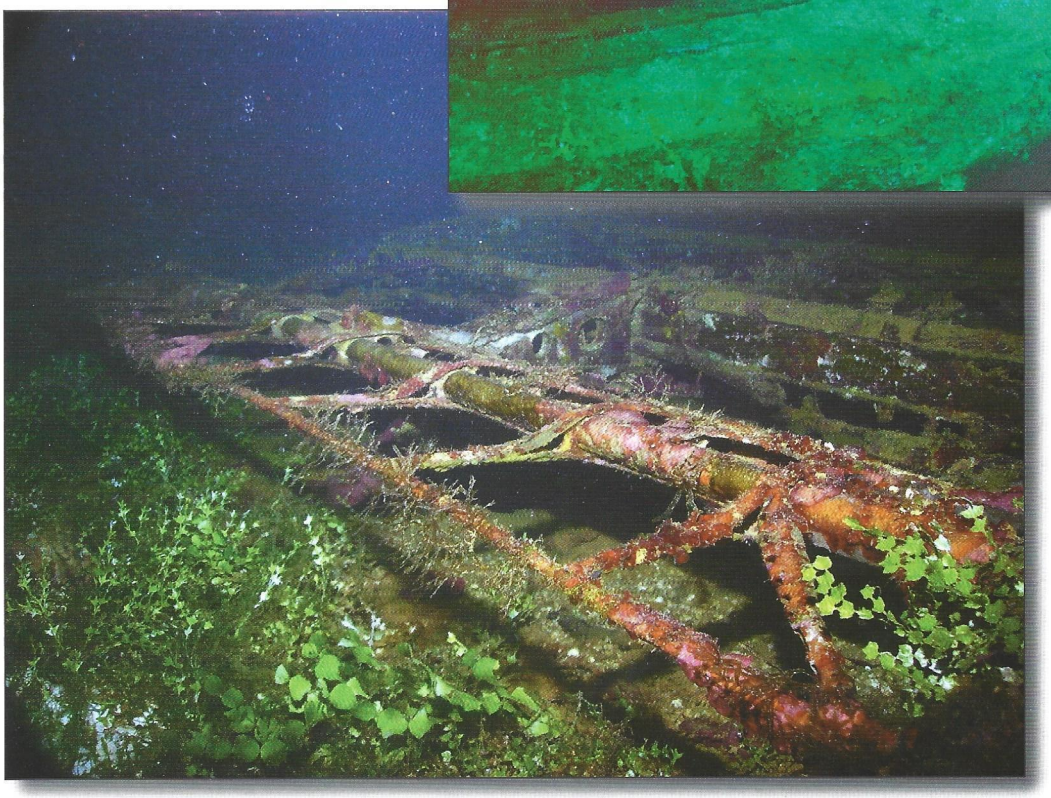
Framework of the wings in cargo hold #1- the v-shaped wing support strut for the right wing can be clearly seen.



Canopy and back of observer's seat on fuselage #2.

Two photos of close-up views of the wing framework in cargo hold #5.

Multiple views of the wings in cargo hold #5.



One of the four E14Y floats on the first level of cargo hold #2.

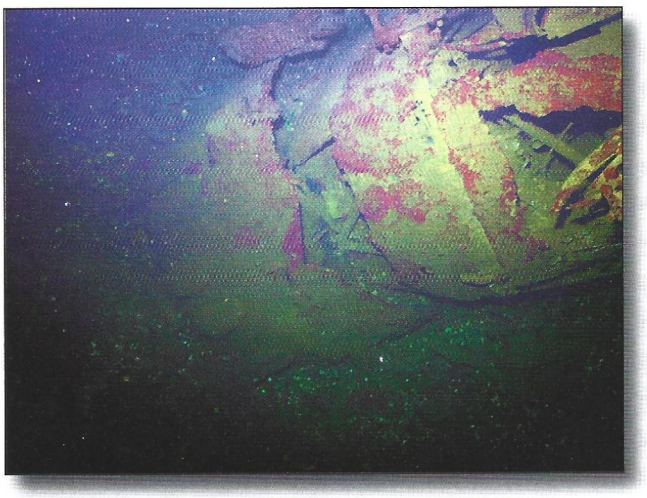
Close-up of the front of the float, showing the mounting point for one of the support struts.

The Japanese stenciled writing "Unpansha"(from bottom to top) is still visible on the 'white' stripe - this means "dolly", and was a marker to show the ground crew where to line up the float when the plane was on its ground dolly.

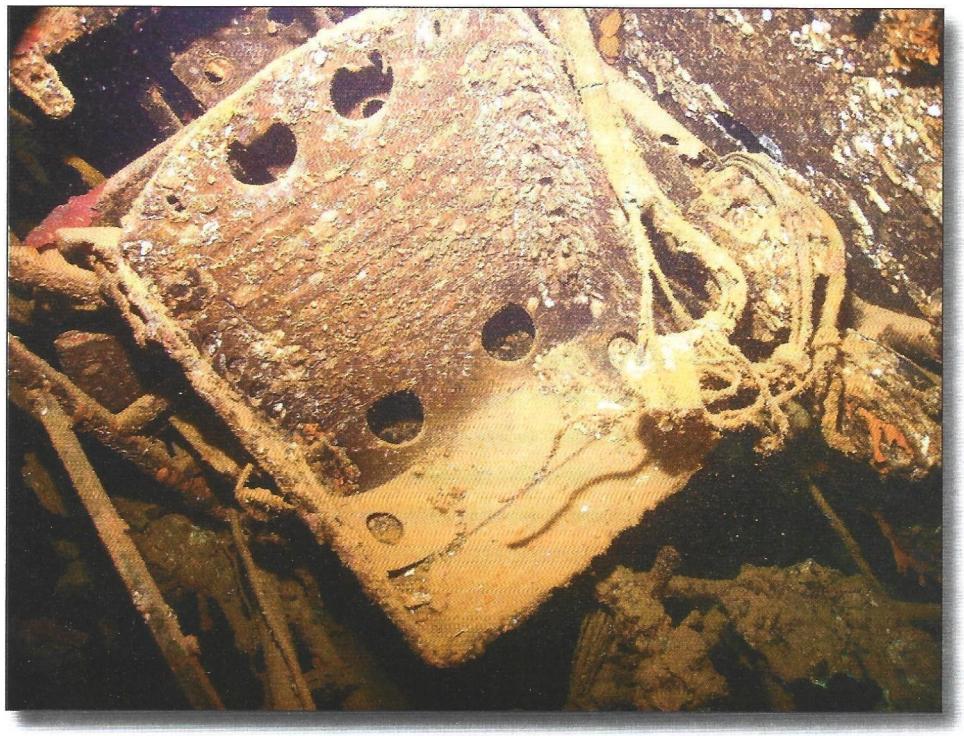
Top and middle. right: Remains of fuselage #2, with tail section and other debris lying on top.

***Above:** View of fuselage #1 showing the structural framework and the pilot's and observer's seats.*

***Bottom left and bottom right.** Engine cowling on fuselage #1*



Observer's seat and a storage compartment on fuselage #1



Pilot's seat and remains of throttle quadrant in fuselage #1

Bottom left: *Structural framework and seats in fuselage #1. One of the E14Y floats can be seen in the background*

Bottom right: *Pilot's cockpit of fuselage #1. The control stick and pilot's foot rails are easily seen in this picture.*

Bibliography

Basil Collier, *Japanese Aircraft of World War II*, Sidgwick & Jackson, London 1979,
Rene J. Francillon, *Japanese Aircraft of the Pacific War*, Funk & Wagnalls, New York 1970,
Handbook of Japanese Aircraft 1910-1945, Model Art Co. Ltd, Tokyo 1989,
Imperial Japanese Navy Aircraft, Koku Fan Illustrated No. 68, Bunrin-Do Co. Ltd, Tokyo 1993,
Imperial Japanese Navy Reconnaissance Seaplane, Famous of the World No. 47, Bunrin-Do Co.Ltd, Tokyo 1994,
Japanese Military Aircraft Illustrated, Vol. 3, Reconnaissance/Flying Boat/Trainer/Transport, Bunrin-Do Co. Ltd, Tokyo 1983,
Japanese Imperial Navy Aircraft, Koku Fan Illustrated No. 38, Bunrin-Do Co. Ltd, Tokyo 1987,
Japanese Imperial Army & Navy Aircraft Color, Marking, Koku Fan Illustrated No. 42, Bunrin-Do Co. Ltd, Tokyo 1988,
Tadeusz Januszewski, *Japanese Submarine Aircraft*, Mushroom Model Magazine Special, Stratus, Sandomierz 2002,
Japanese Military Aircraft Illustrated, Koku Fan Illustrated No. 50, Bunrin-Do Co. Ltd, Tokyo 1990,
Japanese Navy Aircraft of World War II, Air World Inc., Tokyo 1987,
Robert C. Mikesh & Shorzoe Abe, *Japanese Aircraft 1910-1941*, Putnam, London 1990,
V. A. Lesnichenko, A. N. Gusev, *Samolet i podvodnaya lodka*, Galeya Print, Sankt-Peterburg 2001,
Shigeru Nohara, *Imperial Japanese Navy Warplane*, Illustrated Warplane History 5, Green Arrow, Tokyo 1994,
Shigeru Nohara, *Imperial Japanese Navy Seaplanes*, Model Art No. 565, Tokyo 2000,
Shigeru Nohara, *Imperial Japanese Navy Seaplanes*, Kojinsha, 2007,
Tadashi Nozawa & Tadashi Iwata, *Encyclopedia of Japanese Aircraft 1900-1945, Vol. 2 Aichi/Kugisho*, Shuppan-Kyodo, Tokyo 1981,
Kazuo Takahashi, Shinryu Tokubetsu Kogekitai, Kojinsha, 2009
Terry C. Treadwell, *Powietrzny attack spod wody – Historia podwodnych lotniskowców*, AJ-Press, Gdańsk 2002,
Bert and Margie Webber, *Fujita Flying Samurai*, Webb Rearch Group, Publishers, Medford 2000,
William McCash, *Bombs over Brookings*, Maverick Publications, Oregon 2005,

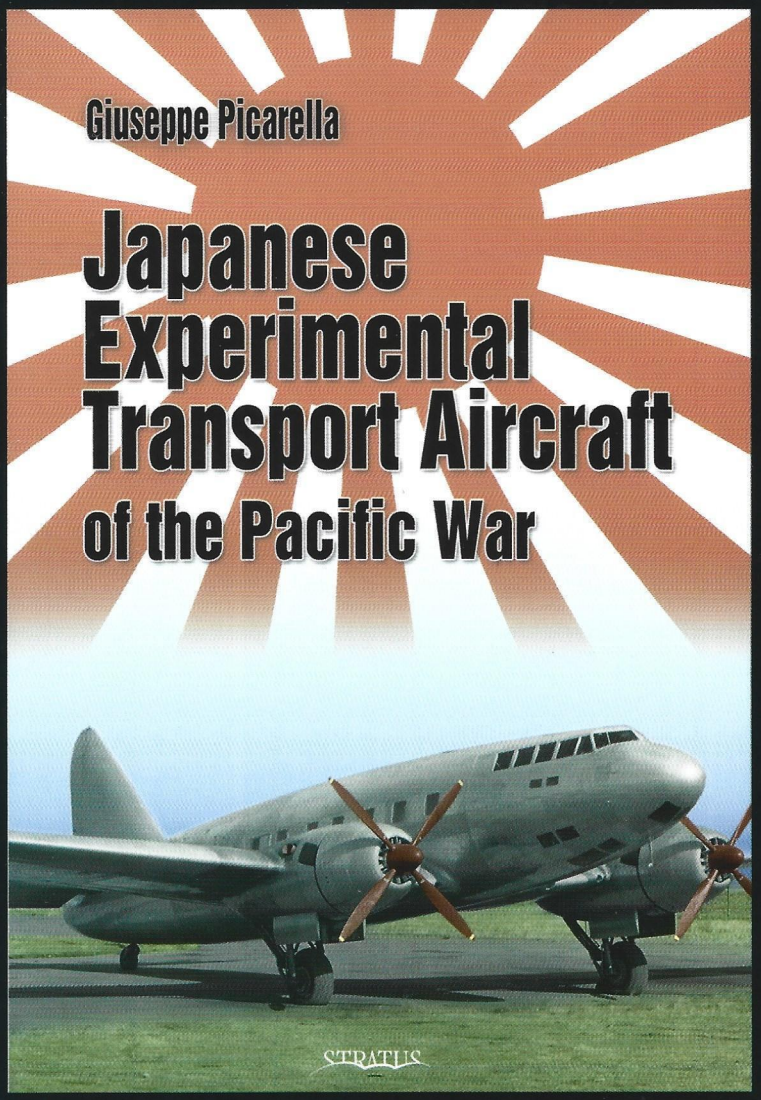
Magazines:
Aireview, Air International, Aviation & Marine, L'album du Fanatique de L'aviation, Letectvi + Kosmonautika, Koku Fan, Maru, Maru Mechanic, Military Aircraft, Model Art, Modelarz, Morze, The Putnam Aeronautical Review, Przegląd Morski, Skrzydlata Polska,

Other sources:
Andrew Obluski
Hideo Watanabe, The former President of Watanabe Engineering Corporation
James F. Lansdale
James Long
http://www.j-aircraft.com

Only one enemy aircraft has ever dropped bombs on mainland USA – and that aircraft was a submarine-launched "Glen" floatplane. This book tells the story of the design, development and operational use of the E14Y1 "Glen".

Included are details of earlier Japanese submarine-launched aircraft, and of the submarines designed and used as seaplane carriers. Profusely illustrated with photos, plans and colour profiles – plus a description and photos of the only remnants of the E14Y1 still in existence, submerged aboard the hulk of the *Akibasan Maru* off Kwajalein Atoll in the Pacific.

Other MMP Book of interest



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